

REPORT
ON
THE SOCIO-ECONOMIC SURVEY
OF
THE NAGARJUNASAGAR PROJECT AREA

VOLUMES- I to V

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Volume I

GENERAL REPORT AND RECOMMENDATIONS.

ANDHRA UNIVERSITY
W A L T A I R

P R E F A C E

The Report on the Socio-Economic Survey of the Nagarjunasagar Project area is in five volumes. The first volume contains the general report and recommendations, and the second deals with the technical aspects. The remaining three volumes contains tables, schedules, instructions, etc.,

We are grateful to the Vice-Chancellor and the Syndicate of the Andhra University for permitting us to carry out the survey and avail of the facilities of the Statistics and Economics Departments for this purpose.

Our thanks are due in a great measure to the authorities of the Nagarjunasagar Project who have given us their valuable co-operation. In particular, we wish to ~~acknowledge~~^{express} our thanks to the Administrators of the Project, the Secretaries of the Control Board, the Chief Engineers of Canals and Dam and other members of the Technical Committee. Sri S. Chakravarty, Administrator of the Project when the Survey was started and Sri D. Viswanatham, the Secretary of the Control Board were everready to help us in our work. We wish to convey our sincere thanks to them. We must place on record our gratitude to late Sri T.S. Rao, of the Reserve of Bank of India, Bombay, who was deeply interested in the survey being started even when the construction of the Project was in its initial stages.

We also thank the Authorities of the Agricultural Department for helping us by sending some of its officers along with us in our familiarisation tours of the Project area.

We thank Dr. T.V. Avadhani, and Dr. D.V. Ramana Honorary Deputy Directors in our Survey, Shri K.V. Satyanarayana, Asst. Director, Sri P.A.V. Bhattan^{an}~~da~~ Swamy and Sri S. Nageswara Rao the Statistical and ~~Research~~ ^R Research Assistants for the very enthusiastic and willing work done by them. ~~We also extend our thanks~~ ~~to~~ Sri M. Jagadheswara Rao of the Economics Department ~~who~~ has done a good bit of computational ^{and} ~~or~~ other work for us, though he is not a member of the staff of the survey. To him also we give our thanks. It gives us pleasure to make particular mention of the untiring and sustained work put in by Sri S. Nageswara Rao but for which, the report would not have been ready even by now. We record our appreciation of his work. Finally we take this opportunity to thank every one who has done work for the survey in some capacity or other.

This Report ^{is} ~~is~~ not merely ^{intended} ~~as~~ a bench mark. It ^{includes} ~~also~~ ~~contains~~ our recommendations for speedy development of the ayacut. Therefore, it became necessary for us to make extensive studies and carry out discussions to evolve procedures for formulating recommendations. With our other duties as Professors we could not avoid the delay that has occurred in submitting the Report.

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DIRECTORS
SOCIO-ECONOMIC SURVEY OF THE
NAGARJUNA SAGAR PROJECT.

May, 1964

VOLUME - 1

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CHAPTER I

INTRODUCTION - ORIGIN, AIMS AND METHODS OF ENQUIRY

1.1. History of the Project

As early as 1903 the composite Madras State investigated the construction of a dam across the Krishna river at Pulichintala to irrigate 6.0 lakhs of acres in Guntur district. Later, in 1930, the Government of Hyderabad investigated the construction of a dam on this river at Nandikonda and proposed a joint scheme with the Government of Madras. About the year 1947, the composite Madras state considered the Krishna Pennar Scheme, and got estimates ready in 1951. In 1952 the Hyderabad Government formulated proposals for irrigating 7.9 lakhs of acres in Hyderabad, and 2.3 lakhs of acres in Nadigama taluk, and also for developing 168000 K.w. power under the Nandikonda scheme. Before taking a final decision on these schemes, the Planning Commission appointed the Khosla Committee to examine the above schemes and recommend the most efficient method of utilising Krishna waters. It was finally decided to construct a high dam at Nandikonda from which place right bank and left bank canals can be taken out to serve the irrigation and power needs of the two states. When the Andhra state was constituted and subsequently integrated with Telengana into Andhra Pradesh, the Project has come to be situated entirely in the state of Andhra Pradesh. This project which was originally known as Nandikonda project has been renamed as the Nagarjuna Sagar Project in honour of the Buddhist Philosopher Nagarjuna-Charya of 2nd century A.D., as the dam site is just 7 miles down stream from the world famous valley of Nagarjurakonda where the sage Nagarjuna-charya lived.

As originally conceived, this project was to be among the world's mighty multipurpose river valley projects, being the highest masonry dam in the world, the third largest artificial storage reservoir-lake brought into existence by engineers on the globe, with its right canal being the world's biggest irrigation canal.

The Project, as finally decided upon and sanctioned, though not so stupendous, is still a huge undertaking being the largest high dam in India, as judged by the ultimate storage capacity of 9.8 millions acre-feet as compared to 7.4 million acres-feet at Bhakra. In height it will be the second highest, coming only next to the Bhakra dam. The project is programmed to be completed in two phases. Accordingly, the dam to be built in the first phase is designed and being constructed for taking the super-structure to be built in the second phase. In the first phase of this Project, the right and left canals are to have lengths of 135 miles and 108 miles respectively. When the second phase of the project is also completed, it will become possible to generate 75,000 K.W. of power at 60 per cent load factor, besides attaining an ayacut of 31.83 lakhs acres.

1.2 Importance of the Project.

As per the localisation policy decided upon by the Government of Andhra Pradesh for the 11.24 lakhs^{of} acres on the right canal side and 8.00 lakhs of acres on the left canal side of the ayacut area to be served by the first phase of the Project, 80 per cent of the ayacut on the left canal side and 33.3 per cent on the right canal side will get irrigation facilities for growing paddy¹, the rest of the ayacut getting facilities for dry irrigation.

1. A small fraction of the area may be localised for sugarcane if conditions permit.

It is thus clear that one of the outstanding benefits of this project is production of rice in respect of which our country is facing a large recurring shortage year after year. Rice being the staple food for the whole of South India and some parts of North India also, this huge Project will in a great measure serve the national needs and help reduce considerably the import of food grains, particularly rice, and thus save for the country a sizeable quantum of foreign aid which can well be used for putting through programmes of the industrial and technical development. Therefore, the Nagarjunasagar Project is truly a great national undertaking

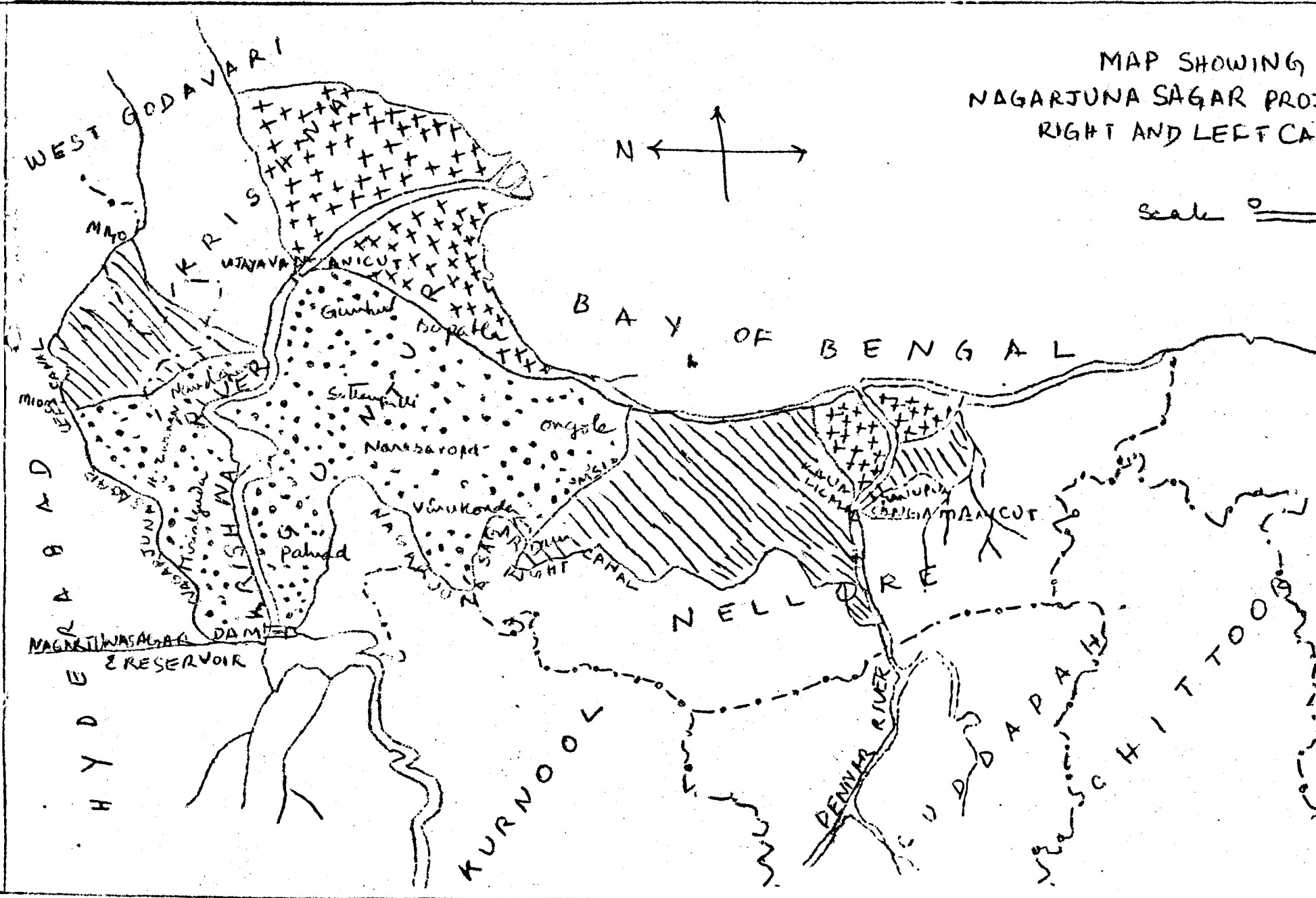
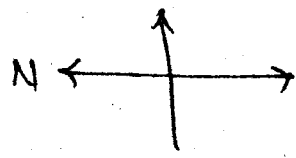
The accompanying map shows the areas to be served by the first phase of the project. It may be seen that the ayacut is spread over Palnad, Sattenapalle, Venukonda, Narsaraopet, Guntur, Bapatla, and Ongole taluks of Guntur district, Darsi taluk of Nellore district, Markapur taluk of Kurnool district under the right canal and Miriyalaguda and Huzurnagar taluks of Nalgonda district, Khammam taluk of Khammam district, and Nandigama and Jaggayyapet taluks of Krishna district under the left canal. Besides these, the project waters will be supplied to 1.5 lakhs of acres for the second crop paddy in the Krishna delta area.

The original estimate of the cost of the project in the first phase was Rs.91.12 crores. The revised estimate was of the order of Rs.139 crores. This revision has become necessary due to increase in the prices of steel, cement and some items ~~of cost~~ of work.




Though the construction of the Nagarjunasagar dam is bound to incidentally reduce floods in the lower reaches of the river Krishna, this aspect has not been a consideration of any importance in the design of the project.

MAP SHOWING
NAGARJUNA SAGAR PROJECT
RIGHT AND LEFT CANALS

Scale 0 _____ 60 miles



LEGEND

-  Existing irrigation
-  Ayacut (1st phase)
-  - DO - (2nd phase)

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In a huge project like this, development of navigation will be a very important benefit. The potentialities of navigation in the canals deserve to be fully examined, and canal transport system evolved as early as possible so that the ayacut region develops at a quick pace.

1.3 Genesis of the Survey:

With given physical characteristics of a region to be served by a project and ~~the~~ also ^{the} economic and social condition of the people living in that area, it is the programme of comprehensive development drawn up and implemented without delay that will make the project yield the best results. To this end, the potentialities must be fully investigated and plans formulated to realise most of the potential benefit in a reasonably short period of time. In short, the need for economic planning for a project region is no less important than the engineering aspect. In recent years, it has been increasingly realised that the failure to achieve the anticipated benefits of a project are in a great measure attributable to lack of advance planning for economic development of the region.

In the case of the Nagarjunasagar Project the Authorities realised the need for avoiding the kind of disappointment experienced in the case of some projects. Accordingly, even when the project ~~is~~ ^{was} in ~~the~~ ^{its} initial stages of construction, the Control Board decided to constitute two Committees, namely, the Development Committee and the Agro-Economic Survey Technical Advisory Committee to advise in drawing up plans for rapid development of the ayacut.

Late Mr. T.S.Rao of the Agriculture Credit Department of ^{The} Reserve Bank of India, Bombay, Mr. S. Chakravarty, Administrator of the Nagarjuna Sagar Project and Dr.K.L.Rao member, Central Water and Power Commission were strongly

of the view that no time should be lost in having the project region surveyed in respect of the present pattern of economic activities in the ayacut villages which will serve as a bench mark for the future, and obtain an appraisal of the existing resource position in the region so as to assess the shortages when irrigation facilities come into existence.

In 1956, the Control Board invited suggestions from various institutions regarding Agro-economic survey of the project region and constituted the above mentioned Technical Advisory Committee. Prof. B. Sarveswararao, Head of the Economics Department, Andhra University, submitted a comprehensive memorandum, and the Indian Council of Agricultural Research also sent another memorandum. These were circulated to the members of the Technical Committee, consisting of the Administrator, Chief Engineer, Nagarjunasagar canals, Representative of the Gokhale Institute of Political and Economics, Representative of the Bureau of Economics and Statistics of Andhra Pradesh, Representative of the Indian Council of Agricultural Research, ~~Director of Agricultural Research, Andhra Pradesh~~, Director of Agricultural ^E of Andhra Pradesh, and two Representatives of the Andhra University. The Reserve Bank of India agreed to depute Sri T.S. Rao, Deputy Chief of its Agricultural Credit Department for important meetings of the committee. The first meeting of the Technical committee was convened in 1957, at which it was decided to have a survey of the project region in two parts to cover the socio-economics and the agro-economic aspects. It was further decided that the Indian Council of Agricultural Research would be in the supervisory charge of the Agro-economic survey.

As for the Socio-economic survey, no institution commanding the confidence of the Control Board came forward to shoulder the responsibility of conducting it. So the Technical Committee desired Prof. D. N. Mahabubkhan and Prof. B. S. Survarao of the Statistics and Economics Department of the Andhra University that we should be in charge of the survey. It was felt by us that we could supervise the Socio-economic survey if the Control Board would organise the field-work. As the Control Board expressed its inability to organise the field work, we also agreed to ^{conduct} the survey in the field. The Andhra University was approached with request to permit us to be jointly in complete charge of the Socio-economic Survey of the project region. The late Dr. V.S. Krishna, who was then Vice-Chancellor, was very enthusiastic about this survey and readily gave his approval. A token sum of Rs. 3,000/- was sanctioned by the Control Board towards expenses for preliminary work by way of touring the area and collecting data, etc. As the Agro-economic survey came to be dropped ~~and~~ subsequently due to lack of funds, ~~and~~ some of its important aspects had to be incorporated into the Socio-economic survey itself. This necessitated the giving up of Urban surveys and Employment surveys, originally included in ^{the} ~~one~~ scope of the Socio-economic survey. It was also decided to cut down the expenditure on the survey to Rs. 2.3 lakhs, because finance was not forthcoming from any separate source, and had to be met from the expenditure on canals.

During our familiarisation tour of the Project area we found that the farmers on the Right Canal side are quite familiar with the methods of growing irrigated paddy and are enterprising enough to take advantage of Canal waters for dry irrigation. On the left Canal side too tradition

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of growing irrigated paddy is fairly widespread. The farmers are anxiously awaiting the supply of waters by this Project for irrigation. ~~xxxx~~ freer movement of skilled farmers and agricultural labour within and around, the Project region may be expected to result in the removal of deficiencies in agricultural skills and bring about adjustment of manpower resources required for growing crops under irrigated conditions.

Before undertaking the tour of the project to know first hand the various problems likely to arise due to the impact of the project on the area, Sri K.V. Satyanarayana, Research Officer, in the Department of Economics, Andhra University, was sent round in summer 1957 to visit the taluk offices in the project area, and gather information relating to the main features of the economy of the region. The Project Authorities made available to us in May 1957 the list of villages in the proposed ayacut, and ~~the~~ information was gathered in respect of each of these villages. The latter part of summer of 1957 was spent in going through the above data, looking ~~for~~ ^{for} meaningful criteria for stratification of the villages in the ayacut.

After this, questions relating to the preparation of frames and sampling procedures were discussed by us with the late Sri T.S. Rao, Dr. N.S.R. Sastry and Sri V.N. Murty of the Reserve Bank of India, Bombay, and later ~~on the~~ ^{with} Shri N.V. Sovani of the Gokhale Institute of Politics and Economics.

1.4. ~~Some Preliminaries~~ ^{Some Preliminaries}

The total number of town and villages as per the delimitation of the ayacut by the Project Authorities in the year 1958, came to ⁶⁶⁹ on the right canal side and ²⁹⁶ on the left canal side. It is ~~xxxx~~ found that villages

having different population ranges are fairly uniformly distributed in the area. It is also found that Commercial crops like Chillies, Groundnut, Tobacco and Cotton are raised in a good number of villages on the right canal side. It was felt that villages in which the area under commercial crops is relatively high may be put into the first stratum, and the other villages on the ~~right~~ right canal side into the second stratum. All the villages on the left canal side are put into ^{the} third stratum without distinction of the importance of commercial crops. We may mention here that the first and second strata are not two separate geographical regions but the villages lie interspersed. It may also be mentioned that, for purposes of the sample surveys, we have excluded from our frames uninhabited or merged villages as well as towns and villages with a population over 5,000 as per 1951 ^D Population census. After this is done, we got 196 villages in the first stratum, 385 in the second and 275 in the third stratum.

Though these preliminaries were finalised in the summer of 1957, the survey could not be commenced till January 1959, because the decision to provide money from the expenditure on canals was taken only towards the end of 1958.

Before going to details of the present survey, we may mention some of the other similar surveys, and the way in which the present survey differs from them. The Gokhale Institute of Politics and Economics at Poona has done pioneering work in its economic survey of the Hirakud Project in Orissa. The Bureau of Economics and Statistics, Hyderabad, has also made an economic survey of the Tungabhadra Project area. Lastly, we may also refer to the survey of the Bhakra Nangal

Project area by the Delhi School of Economics. While all these surveys are essentially of a bench mark nature, the present survey goes further in its scope. It will be seen from the objectives of the survey mentioned at a subsequent stage of this chapter that specific recommendations are to be made in the report for attaining full ayacut without undue delay, so that optimal or near-optimal benefits accrue in a short-run period itself. As already mentioned, the desire to plan in advance was responsible for the starting of the survey alongside of the construction of the project. The other distinguishing feature of this survey is that, apart from the routine calculation of benefit cost ratios, method of linear programming has been employed to assess the potential benefit in the agricultural sector, and work out resource and credit requirements for adoption of crop patterns which are considered optimal on the basis of certain assumptions.

1.5. Objectives of the Survey:

The objectives of the Socio-Economic survey of project area undertaken by us are as follows:

- i) To obtain information in respect of the existing crop pattern, agricultural production and incomes, land holdings, farm and non-farm resources, etc., ⁱⁿ the rural areas of the Project region to serve as a bench mark;
- ii) To assess the agricultural potential of the project area;
- iii) To give an appraisal of the changes that are likely to be brought about in the Crop Pattern in the wake of supply of Project waters for irrigation;
- iv) To assess the requirements of credit and other facilities for utilisation of Project waters without delay; and
- v) To make recommendations for quick development of the ayacut.

1.6. Types of surveys undertaken.

For organising the survey in its various aspects we decided upon conducting surveys of the following types.

i) Census Survey of sample villages: A random sample of 7 villages from the 1st stratum, of 12 villages from 2nd stratum, and of 10 villages from 3rd stratum were drawn and their names listed. In each of the sample villages, information was collected on a number of items in respect of every household. This information has been used for preparation of frames for drawing appropriate samples for surveying farm and non-farm activities. The underlying idea is that the collection of households in the sample villages in each of the strata are representative of all the households of all the villages in the corresponding stratum.

ii) Farm Surveys: In each of the sample villages in a stratum the cultivating households (i.e. households engaged in the cultivation of land, owned or leased in, big or small) are arranged in descending order of the extent of the operational holding, and divided into five groups of equal number of holdings. From each of the quintile groups, a random sample of 4 cultivating holdings is drawn, resulting in a sample of 20 per village. The agricultural activities of these households are then taken up for intensive study by investigators trained for the purpose and posted to be incharge of a group of 3 to 4 sample villages. Each investigator is to reside in a village for some weeks, post the data relating to the farm activity of the sample households in the schedules, and move to the next village, and complete one round in a period of four months. Thus in a year he used to make three rounds, and gather by personal contact reliable details of the agricultural activities of the households. The investigator was trained to post the

information for fixed periods of the crop year 1959-60, irrespective of the place of his actual stay during any give period of time.

iii) Non-farm Surveys: Using the information gathered in our Census survey, frames of households engaged in 16 different types of non-farm activities in the sample villages were drawn up for each of the strata, and listed in descending order of income accruing from the enterprise. In each case, the households were stratified by income, and random samples of suitable sizes were drawn for intensive study. Sometimes, the frames had to be pooled together to form a single one for the entire Right Canal area, and sometimes for the entire project region.

One point has to be made clear in this connection. The study is in terms of mutually exclusive activities of farm and non-farm. As such, a household engaged in both activities may sometimes occur in the lists of sample households for intensive farm studies as well as for non-farm studies.

iv) Village Surveys and Taluk Reports: Apart from the above three surveys, general information was gathered about ~~xxxx~~ all the sample villages as also about villages in the Project region obtainable from records available at the taluk headquarters. These two compilations are sometimes referred to in the report as village surveys and taluk reports.

v) Survey of trade, marketing, transport and credit: A survey of trade in agricultural produce and processing industries in selected urban areas and transport facilities to and from the important market centres in and around the Project area was also carried out.

vi) Survey of wet villages: With a view to gain insight into the likely changes to come about in the villages after receiving the irrigation facilities from the project, four villages near to the Project region which have received the benefit of Canal irrigation in the recent past have also been surveyed. As a matter of fact, this survey alone would not give us a firm basis for projecting into the future, for which we had to draw upon various reports relating to the farm management studies and the like. Another reason for carrying out the survey of these villages is that they would give an idea of the costs of conversion of lands from dry to wet. The survey of these villages is sometimes referred to as Survey of Wet Villages.

vii) Survey of Control Villages: A purposive sample of seven villages four lying close to the Right Canal area and three lying close to the Left Canal area has been selected and the villages have also been surveyed. These will serve as control villages. At a future date, if a resurvey of these villages is made, the disparity in the development of these villages and of the villages in the ayacut area will indicate the order of magnitude of the irrigation benefits. The data are preserved for use at the time of repeat survey at a future date.

1.7. Organisation of the Survey:

The organisational set up is as follows:

Headquarters staff at the University Campus

Two Honorary Directors in Joint Charge:

Two Honorary Deputy Directors

One Statistical Assistant

One Research Assistant

Office staff for computational and tabulation work, typists, clerk, and peons.

Field Staff:

One Assistant Director in charge of the Area Office at Guntur

Three Field Officers

Investigators, Clerk

Jeep driver and peons²

Besides the above staff enumerators were employed for completing the Census Survey rapidly on payment on a piece-rate system, as the Census Survey formed the basis for frames for drawing samples for other surveys. In fact, during the Census Survey, almost all the staff at the headquarters was working in the field to complete the work in as record a time as possible.

1.8. Conduct of the Survey:

Graduates fully familiar with the villages to be surveyed were recruited and given training at the headquarters. During this training not only were they made familiar with definitions and concepts, ^{but} they were ^{also} taught as to why the various schedules were so drawn up and how the various entries could be combined to yield the required figures relating to the various aspects. Their work in the field was constantly supervised by Field Officers and the Assistant Director. Notwithstanding all this, difficulties had been experienced at the stage of final processing of the data. In the case of non-farm studies in particular, we had to be content with working out the input-output structure of some 16 enterprises for which the posted information was considered to be meaningful. The rest of the data has been left out of analysis.

On occasions the difficulty was also felt in respect of lack of persons with special knowledge in the fields of engineering, agriculture, and ^{Soil Science}

2. For a detailed statement of the staff see appendix at the end of this chapter.

1.9. Method of Analysis:

Coming next to the methods of analysis of data, the cost accounting method employed in farm management studies has been used. In forming estimates, appropriately weighted sums of averages have been adopted. In the context of making projections into future, we have used the method of linear programming in combination with the Government's policy of localisation. Assuming increase in farm resources which we have considered reasonable and which leave no part of the land unirrigated, the optimal crop pattern was worked out so as to bring the maximum benefit to the ^{Community} at large. The programming has been done in respect of 4 typical sizes of farms on the Right Canal side and for four farms of similar nature on the Left Canal side.

The crops judged to be most important during the short run period of ten years after the completion of the first phase of the Project are paddy, Chillies, country tobacco, Ragi, Jowar and Redgram-mixture on the Right Canal side and paddy, Chillies, Country tobacco, Vegetables, Groundnut+redgram, Jowar+Cucumber and other mixtures on the Left Canal side. In this connection the following aspects may be touched upon:

i) Position of sugar cane: It is quite likely that a part of the area in the ayacut will be localised for sugarcane. As we have no information as to where and how it will be localised, we have not built this into the picture. This is particularly dependent on the Government's policy of giving perennial irrigation facilities and the establishment of sugar factories.

ii) Position regarding cotton:- Though the crop-pattern suggested by the Agricultural Department contains

cotton as one of the important dry irrigated crops, we feel that with the present quality of yields and the prevailing prices it will not be advantageous to the farmer to grow this crop. There are several other decidedly more profitable crops both from the point of view of the farmer and of the community. However, in the long run, cotton may become a profitable crop if the relative price structure of crops and other factors move favourably to cotton.

iii) Position of groundnut: We feel that the position of groundnut is not really going to be what the results of programming indicate on the Right Canal side where it is not at all in the picture. The value added by this crop comes very close to jowar+redgram. As such, for several reasons cultivators may wish to grow the groundnut crop. In fact, the picture on the Left Canal side indicates that groundnut as a mixed crop is quite attractive. At one of the meetings of the Technical Committee at which Sri B. Venkatappaiah, then Deputy Governor of the Reserve Bank of India and Dr. K.L. Rao, Member of the Central Water and Power Commission were present, the question of credit requirements was discussed which led us to the question of crop pattern which in its turn was felt to be dependent on the Government's policy with regard to the location of the various processing industries in the Project region. This is being mentioned here because, if in any particular area decorticating factories and groundnut oil mills are located, several farmers may prefer to grow groundnut on account of the ready marketability of the produce without having to go in for storage facilities, etc. In such a case, the location of these factories in the area will more than compensate any small difference in the profit which they may have to forego by not growing the slightly more profitable crops. Further, the farmers may, by tradition, grow the groundnut crop if it is nearly as profitable as a crop which occurs in the optimal crop pattern.

iv) Position of pulses. As the intensity of cropping is likely to go up after the completion of the project, pulses and other oil seeds are also likely to be grown in the paddy fallows and or as second crops.

In the light of the above remarks the optimal crop **the diversification of the crops in the Project area** pattern worked out by us will not adversely reduce when the farmers actually come to adopt it with modifications based on their own tradition and habit.

1.10. The Project Pays itself:

The project is seen to be a paying proposition, judged by the benefit-cost ratio criterion which is estimated to be of the order of 4.74 even when only the direct benefits to the community are considered. If this question of benefit-cost ratio is examined in the context of the completion of also the second phase of the Project, the position will be much more satisfactory, because considerable extension of irrigation facilities can be achieved with marginal expenditures for increasing the height of the dam and the lengths of the canals. The spread effects will also be more pronounced because a much vaster region will receive the benefits. Even judged by consideration of financial returns on the Government's investment, the project is paying, especially when the augmentation of government revenues from sale of hydro-power, and ^{from} further yields of taxes levied by the central and state governments, as trade and industry expand in the area is taken ^{into} ~~into~~ account. In estimating the benefits of the Project in ^{the} agricultural sector, we have not assumed any spectacular changes in agricultural practices. We have only assumed that fertilisers and better seed will be used, by the farmers in growing the crops to which they are used, provided that necessary resource requirements become available to them either through self-finance or through the government and other agencies.

: 18 :

The opening up of the region by new railway lines and traffic routes will have to be planned and executed expeditiously, as otherwise movements of goods or produce into the Project region and outside it will be greatly hampered and the flow of benefits from development ~~retarded~~. This point was also stressed by Sri Tirumala Iyengar, the Chief Engineer of Hirakud Project in a discussion we had with him regarding methods of rapid achievements of the ayacut in an irrigation project.

1.11. Follow-up surveys:

It will be extremely illuminating and useful to carry out follow up surveys of the region at intervals of 10 or 15 years to assess the rate of development of the region.

CHAPTER 1Appendix 1

Statement of Personnel who worked in the Socio-Economic Survey
of the Nagarjuna-Sagar Project

(Excluding the enumerators employed for the census survey)

Head-Quarters staff:Honorary Directors in Joint charge of the survey:

Prof. K. Nagabhusanam, M.A., Fil. Lic. D. Fil. (Stockholm), Department of Statistics, Andhra University.	Prof. B. Sarveswara Rao, M.A., Ph.D. (Cantab.), Department of Economics, Andhra University.
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Honorary Deputy Directors

Dr. T.V. Avadhani, M.A., Ph.D., F.S.S. Department of Statistics, Andhra University.	Dr. D.V. Ramana, M.A., (Hons.), Ph.D. (Chicago), Department of Economics, Andhra University.
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(From Jan, '59 to Sept, '60)

Statistical and Research Assistants

Mr. P.A.V. Bhattanadhaswamy, M.A., M.Sc., (1-2-59 to 31-3-62)	Mr. S. Nageswara Rao, M.A., M.Sc., (1-1-59 to 31-3-62)
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Computers

Mr. C. Krishnamurty, M.A.,	(21-2-59 to 30-6-59)
Mr. B.P.V. Sarma, B.A. (Hons)	(13-11-59 to 14-4-60)
Mr. V.V. Bhanoji Rao, M.A.,	(15-9-60 to October 1960)

Clerk - cum - Tabulators

Mr. C. Balakrishnamurty, M.A.,	(10-5-59 to 30-6-59)
Mr. K. Guruvulu, M.A.	(10-5-59 to 30-6-59)
Mr. A.V. Radhakrishnamurty, M.A.	(10-11-59 to 31-7-1960)
Mr. K.V.S. Chalapathirao	(14-5-59 to 4-10-1960)
Mr. M. Satyanarayanamurty,	(15-5-61 to 2-1-62)
Mr. A.K.V. Sastry	(1-7-59 to 12-5-1961)
Mr. P. Soma Raju	(1-11-1960 to 18-9-1961)
Mr. D. Sambamurty, M.A., D.C.R.S.,	(23-8-60 to 2-9-60)

Clerks

Mr. K. Narashimamurty, B.A.	(5-1-59 to 25-9-60)
Mr. R. Gopalakrishnayya	(1-2-59 to 7-4-60)

Mr. M. Satyanarayanamurty (9-8-1960 to 14-5-61)
 Mr. V. J. K. Sarma (8-8-60 to 31-3-62)

Draughtsman

Mr. I. Hanumantharao (14-5-59 to 6-6-60)

Peons

Mr. Ch. Desi Reddy (1-1-59 to 31-3-62)
 Mr. M. A. Subhan (1-1-59 to 30-10-61)
 Mr. S. Fareed. (12-9-60 to 31-3-62)

Area Office Staff (At Guntur)

Assistant Director

Mr. K. V. Satyanarayana, M.A. (Hons) (1-2-59 to 28-3-61)

Field Officers

Mr. K. Chalapathi Rao, M.A., (9-2-59 to 31-3-62)
 Mr. V. Thirupathi Naidu, M.A. (1-2-59 to 14-7-60)
 Mr. C. Krishnamurty, M.A. (1-7-59 to 31-10-61)
 Mr. G. Koteswara Rao, M.A. (1-8-60 to 2-9-60)
 Mr. K. Hanumantha Rao, B.A. (3-9-60 to 30-10-61)

Investigators

Mr. K. Hanumantharao, B.A. (9-2-59 to 2-9-60)
 Mr. G. Koteswararao, M.A. (22-12-59 to 31-7-60)
 Mr. A. Viswanatham, B.A. (9-2-59 to 30-10-61)
 Mr. Ch. Abbaiah, B.A. (9-2-59 to 30-10-61)
 Mr. K. Masthan, B.Sc. (9-2-59 to 19-7-60)
 Mr. K. V. Chalapathi Rao, B.A. (9-2-59 to 22-11-59)
 Mr. L. Narashima Rao, B.Com., (1-3-59 to 17-3-60)
 Mr. D. Peddi Reddy, M.A., B.Com. (16-2-59 to 7-2-61)
 Mr. S. Lakshminarayana, B.A. (9-2-59 to 1-8-60)
 Mr. K. Punna Reddi, B.A. (9-2-59 to Dec, 1960)
 Mr. E. Subba Rao, M.A. (20-7-59 to 31-7-1960)
 Mr. K. Guruvulu, M.A. (15-10-59 to 9-9-60)
 Mr. ^C K. Balakrishnamurty, M.A. (1-7-59 to 24-10-60)
 Mr. N. Hanumareddy, B.A. (1-7-59 to 1-8-60)
 Mr. A. Hanumareddy, B.A. (20-7-59 to 1-8-60)
 Mr. T. C. K. Sastry, B.Com., (1-7-59 to 10-7-60)

- Mr. V.V. Subba Rao, B.A. (Hons) (8-7-59 to 29-7-60)
- Mr. A.V. Radhakrishnamurty, M.A. (1-8-60 to 30-10-61)
- Mr. V.V. Bhanoji Rao, M.A. (October 60 to 31-7-61)
- Mr. A. Somasekhar, M.A. (16-9-60 to 5-3-61)
- Mr. C.S. Madhavarao, M.A. (8-8-60 to 23-3-61)
- Mr. V.K.M. Tilak, M.A. (9-8-60 to 30-12-60)
- Mr. K. Babu Rao, B.A., B.L., D.C.R.S., (10-11-60 to 3-4-61)
- Mr. M.V. Subbarayudu, M.A. (10-8-60 to 15-11-60)
- Mr. M. Subba Rao, M.A., M.Sc. (16-5-61 to 30-10-61)
- Mr. C. Sankaranand, M.A., B.L. (8-12-60 to 13-5-61.)
- Mr. T. Chittaranjan Sarma, M.A., (15-9-60 to 30-10-61)
B.Com., B.L.
- Mr. N. Appalanaidu, M.A. (8-8-60 to 31-8-60)
- Mr. G. Subrahmanyam, M.A. (~~28~~ 2-8-60 to 8-12-61)
- Mr. T. Rama Rao, M.A., M.Sc., (10-8-60 to 8-12-61)
- Mr. K.V. Subba Rao, M.A. (8-8-60 to 30-10-61)

Jeep Driver

Mr. K. Subba Rao (30-3-59 to ^{November} 60)

Clerk

Mr. B. Radhakrishnaiah (1-2-59 to 11-5-60)

Peons

Mr. G. Mallayya (1-2-59 to March 61)

Mr. Sheik Masthan (1-4-59 to September 60)

B. When the Area office was wound ^{up} in November 1960, the entire staff at this office were transferred to work at the Headquarters at Waltair.

CHAPTER II.

RURAL ECONOMY OF THE NAGARJUNASAGAR PROJECT AREA..

2.1. General.

The area of the Nagarjunasagar Project comprises, as indicated in the previous chapter, some of the least developed and least prosperous parts of the Coastal Andhra region and of the Telengana region of Andhra Pradesh. The principal source of livelihood for the people of these areas is agriculture which had come to be stabilised at very low levels of productivity on account of lack of irrigation facilities, dependence on uncertain rainfall, and lack of incentives and inability of the farmers to adopt improved methods of agriculture. The area also remains extremely backward in respect of the development of power, transport and industry. Consequently the Nagarjunasagar Project area constitutes at present a most backward region of Andhra Pradesh with extremely low levels of production and standards of living. It is a matter of considerable interest in this connection to note that even in this area, which forms a contiguous part of the lower Krishna river basin, there are wide disparities between the Andhra part and the Telengana part in resource productivity, levels of output and standards of living. The Telengana part is more backward than the Andhra part, and the marked differences in the economic characteristics that exist between stratum 1 and stratum 2 on the one hand (the Andhra part) and Stratum 3 on the other hand (the Telengana part) will be pointed out in detail in the course of this chapter, in which an attempt is made to describe the dominant features of the rural economy of the Project area dealing with the following aspects in particular.

1. Growth of population and density,
2. Occupational distribution of the population,
3. Distribution and fragmentation of land holdings,
4. Cropping pattern and crop yields, agricultural practices, and marketing and credit facilities,
5. Assets and liabilities of farmers,
6. Resources available to the cultivators (land, manpower, work cattle and implements),

7. Employment and unemployment of workers and work cattle,
8. Land improvement expenditure and capital formation; and
9. Incomes of rural households.

The data used in giving this account are mostly based on the information collected in the course of the sample surveys conducted by us and to some extent on the official records and statistical publications available to us.

2.2. Growth of population in the Region.

The total population of the sample villages in S_1 as enumerated in our Census survey came to 21,221 and the number of households to 4,653. According to the 1951 Census the total population was 19,370 persons, the number of households being 4,183. The population of these villages thus registered an increase of 9.56 per cent during the period 1951-59, which means an annual rate of increase of 1.20 per cent. The population in S_2 villages came to 15,231 with 3,123 households in 1959, as compared with the 1951 Census figures of 14,429 with 2,964 households. The increase in population during the period was thus 5.56 per cent or 0.69 per cent per year, which is considerably less than in S_1 . In S_3 villages the increase in population was from 18,083 with 3,708 households in 1951 to 18,826 with 3,883 households in 1959. This amounted to an increase of 4.11 per cent or an annual rate of increase of 0.51 per cent which is less than the rate of increase in S_1 as well as S_2 .*

The population of cultivator households according to our Census survey came to 63.7 per cent of the total population in S_1 as compared with 73.6 per cent in S_2 and 62.6 per cent in S_3 . It may be noted in this connection that a cultivator household is defined as one having cultivation as main or subsidiary occupation, irrespective of the size of the operational holding. Our Census survey thus shows that more than 60 per cent of the population in the sample villages belong to the cultivator households.

Foot Note: * A separate sheet attached. Page 24

*Foot Note:

Growth of population (in thousands) in the Nagarjuna
sagar Project area.

	1951 Census	1961 Census	Rate of increase (annual)
Guntur district	2,560.1	3,010.0	1.76
Taluks of Ongole, Narsaraopet, Vinukonda, Palnad and Sattenapalli in the Guntur district.	1,147.9	1,308.2	1.39
Nalgonda district	1,287.2	1,574.8	2.23
Taluks of Huzurnagar and Miriyalaguda in the Nalgonda District	165.2	198.8	2.03
	128.2	222.4	7.35
Nandigama taluk in Krishna district.	146.0	168.2	1.52

The rates of growth of rural and urban population cannot be calculated separately as the definition of urban population (towns) was changed in the Census of 1961. The rate of growth of rural population would be however less than the rate of growth of total population. The abnormal rate of growth of population in Miriyalaguda taluk was due to immigration and the growth of the new town of Vijayapuri (Nagarjunasagar) with 55.4 thousand population in 1961 and other areas connected with the construction of the Nagarjunasagar dam and canals. There was also considerable exodus of population from villages to these areas for employment. The low rate of growth of population noticed in S₃ has to be attributed to these factors.

Table No. 2.1.
Growth of Population.

Stratum	Population			Percentage of population of cultivator households to total.
	1951	1959	Annual rate of increase	
(1)	(2)	(3)	(4)	(5)
S ₁	19,370	21,221	1.20	63.7
S ₂	14,429	15,231	0.69	73.6
S ₃	18,083	18,826	0.51	62.6

2.3. Density of population:

Density or concentration of population in a region is measured by the number of persons per square mile of geographical area. Generally speaking, a higher density of population is to be expected in a region where there is greater prosperity. The density of population in the three strata is given below for the year 1951 and 1959. For purposes of comparison data for the density of population in the districts of Guntur and Nalgonda and in the different regions of Andhra Pradesh are also given for the Census years 1951 and 1961.

Table No. 2.2.
Density of population.
(No. of persons per Sq. mile)

Stratum	1951	1959		1951	1961
S ₁	381	418	Guntur district	509	519
S ₂	285	301			
S ₃	238	248	Nalgonda district	233	287
			Telengana	253	286
			Rayalaseema	219	250
			Coastal Andhra	381	448
			Andhra Pradesh	295	339

The density in S₃ was 248 in 1959 as compared with 418 in S₁ and 301 in S₂ in the same year. While the whole area of the Project

is of low density, the density in S_3 villages indicates that they are less developed than S_1 and S_2 villages.

2.4. Size of household.

The average size of a household comes to 4.56 persons in S_1 as compared with 4.88 persons in S_2 and 4.85 in S_3 as shown in table No. 2.3. We find however that the average size of a cultivator household is larger than that of a non-cultivator household in all the three strata. The average cultivator household has 5.00 persons in S_1 as compared with 5.32 persons in S_2 and 5.37 persons in S_3 . The size of the household in S_2 or S_3 is considerably larger than in S_1 . The number of adults per cultivator households is found to be highest in S_2 equal to 3.48 persons, as compared with 3.37 persons in S_1 and 3.38 persons in S_3 . The non-cultivator household as already noted, is considerably smaller in size as compared with the cultivator household in all the strata. We do not however find noticeable differences between the three strata in respect of both the size and the average number of adult persons in these households.

Our Census survey shows (Census survey Table Nos. 2 and 3) a high positive correlation between the size of the operational holding and the size of the cultivator household. In the case of non-cultivator households we find similarly a high positive correlation between the income size groups and the size of the household. In the case of both types of households and in all the strata the size of the household increases more than two fold between the lower and the high size groups.

Table No. 2.3.

Size of cultivator and non-cultivator households.

	S_1	S_2	S_3
Average size of all households	4.56	4.88	4.85
Average size of cultivator households	5.00	5.32	5.37
Average size of non-cultivator households	3.95	3.96	4.17
Number of adults per cultivator household	3.37	3.48	3.38
No. of adults per non-cultivator household	2.56	2.54	2.58

2.5: Classification of households according to livelihood classes (main occupation).

Adopting the 1951 Census classification of means of livelihood, the households in the sampled villages are divided into 8 classes according to the principal means of livelihood (Census Table No. 5). The occupational distribution of the cultivator households is also shown with reference to the size groups of operational holding. It may be seen from the tables that more than 70 per cent of the households constitute agricultural classes in every stratum. We also find that the proportion in S_2 is higher than in S_1 and the proportion in S_3 is higher than in S_2 . If we take the cultivator households into consideration, this comparative picture of S_3 becomes even more conspicuous. 87.7 per cent of the cultivator households in S_3 have agricultural occupations as compared with 82.7 per cent in S_2 and 83 per cent in S_1 as shown in the table No. 2.4 given below. Among the non-cultivator households 71.6 per cent of the households in S_3 have agricultural occupations, the predominant occupation being agricultural labour, as compared with 59.4 per cent in S_2 and 58.9 per cent in S_1 .

(1 to 4 Census classes)

Among the households having agricultural occupations/belonging to either ~~(1-4 Census classes)~~ cultivator or non-cultivator households, we find that agricultural labour households constitute 55.4 per cent in S_3 as compared with 45.2 per cent in S_2 and 48.2 per cent in S_1 .

Table No. 2.4

Livelihood Classification of households (main occupation).

	S ₁ per cent	S ₂ Per cent	S ₃ Per cent
<u>Cultivator Households</u>			
(a) With agricultural occupations	83.1	82.7	87.7
(b) With non-agricultural occupations	16.9	17.3	12.3
Total	100.00	100.00	100.00
<u>Non-cultivator households</u>			
(a) With agricultural occupations	58.9	59.4	71.6
(b) With non-agricultural occupations	41.1	40.6	28.4
Total	100.0	100.0	100.0
<u>All households</u>			
(a) With Agricultural occupations	71.8	75.1	80.7
(b) With non-agricultural occupations	28.2	24.9	19.3
Total	100.0	100.0	100.0
<u>Agricultural households</u>			
(a) With agricultural labour as main occupation	48.2	45.2	55.4
(b) With owner cultivation as main occupation	39.7	48.7	38.7
(c) With tenant cultivation as main occupation	3.9	2.9	2.6
(d) Rent receiving	8.2	3.2	3.3
Total	100.0	100.0	100.00

2.6. Classification of households according to Livelihood classes (subsidiary occupation)

It is common knowledge that a household in rural areas has generally more than one means of livelihood or source of income. Not only households with agricultural occupations as main occupations predominate in rural areas, but also a high proportion of

non-agricultural households have agricultural occupations as subsidiary means of livelihood. The classification of households according to the first subsidiary occupation (first in importance among the subsidiary occupations) is shown in Census table No. 6. It may be seen from this table that in S₁ 61.4 per cent of households with owner-cultivation as main occupation have subsidiary occupations which in order of importance are Industry, Agricultural labour, and Tenant cultivation. 71.3 per cent of households with agricultural labour as main occupation have subsidiary occupations which are mainly Industry and Owner cultivation in order of importance. 76.3 per cent of the non-agricultural households have subsidiary agricultural occupations which in order of importance are mainly Agricultural labour and Owner cultivation. In S₂ villages 74.3 per cent of owner cultivators have subsidiary occupations which are mainly Industry, Agricultural labour and Tenant cultivation in order of importance. 80.6 per cent of Agricultural labour households have mainly Owner cultivation and Industry as subsidiary occupations. Among the non-agricultural households, 77.9 per cent have Owner cultivation, Agricultural labour and Rent-receiving as their ~~XXXX~~ subsidiary occupations in order of importance. In S₃ villages 53.9 per cent of owner cultivators have, as in S₁ and S₂, Industry, Agricultural labour and Tenant cultivation as their first subsidiary occupations. 64.8 per cent of agricultural labour households have Owner cultivation, Rent receiving and Industry as their subsidiary means of livelihood. 69.0 per cent of non-agricultural households have Owner cultivation, Agricultural labour and Rent-receiving as important subsidiary occupations. Taking all households into account we find, that 57.3 per cent of them do not have any subsidiary occupations in S₃ as compared with 22.2 per cent in S₂ and 29.2 per cent in S₁; and of the rest having subsidiary occupations, those having agricultural occupations as subsidiary occupations come to 70.8 per cent in S₃ as compared with 61.6 per cent in S₂ and 60.2 per cent in S₁. The number of households which do not have any agricultural occupations as main or first subsidiary means of livelihood constitutes a very small proportion of the total number of households in all the strata, accounting for 6.1 per cent in S₃, 7.3 per cent in S₂ and 9.8 per cent in S₁. These percentages will be still less

If they are based on population and not on households, because the average size of a cultivator household is higher than that of a non-cultivator household. The main features of the livelihood classification of households according to subsidiary occupations are given in the following table No. 2.5.

Table No. 2.5

Livelihood classification of households (subsidiary occupations)

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
Owner-cultivator households having subsidiary occupations as percent of total owner cultivator household.	61.4	74.3	53.9
Agricultural labour households having subsidiary occupations as percent of total Agricultural labour households	71.3	80.6	64.8
Non-agricultural households having subsidiary occupations as percent of total non-agricultural households	76.3	77.9	69.0
Households not having subsidiary occupations as percent of total households	29.2	22.2	37.3
Households with subsidiary agricultural occupations as percent of total households with subsidiary occupations.	60.2	61.6	70.8
Households not having main or subsidiary agricultural occupations as percent of total households	9.8	7.3	6.1

The number of households engaged in cultivation of land, irrespective of their principal means of livelihood, will be of course less than the number of households with one or more agricultural occupations as main or subsidiary. Of the households not having owner cultivation or tenant cultivation as their main source of livelihood, 39.0 per cent still constitute cultivator households in S₁ as compared with 46.9 per cent in S₂ and 34.8 per cent in S₃; and cultivation is more or less equally important in all the strata for all the households with Agricultural labour, Industry, Commerce, Transport and 'Others' as the main sources of livelihood. Taking all households into consideration, 58.1 per cent of them constitute cultivator households in S₁ compared with 67.5 per cent in S₂ and 56.5 per cent in S₃. These details are given in the following table No. 2.6.

Table No. 2.6.

Distribution of households having cultivation as main or subsidiary occupation

Main Occupation	Stratum-1			Stratum-2			Stratum-3		
	Number of Households	Number of Households		Total ^{number} of households	No. of households with cultivation as main or subsidiary occupation	(6) as a percentage of (5)	No. of Households	No. of Households with cultivation as main or subsidiary occupation	(9) as percentage of (8)
		Total	Of which households with cultivation as main or subsidiary occupation						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Owner cultivators	1,325	1,325	100.00	1,142	1,142	100.00	1,214	1,214	100.00
2. Tenant cultivators	129	129	100.00	68	68	100.00	80	80	100.00
3. Agricultural Labour	1,611	630	39.11	1,059	519	49.01	1,737	627	36.10
4. Rent receivers	275	107	38.91	75	12	16.00	103	4	3.88
5. Industry	677	264	38.99	306	166	54.25	364	139	38.19
6. Commerce	181	62	34.25	178	64	35.96	115	30	26.09
7. Transport	43	20	46.51	2	1	50.00	12	7	58.33
8. Others	412	164	39.81	293	135	46.08	258	94	36.43
Total (item 3 to 8)	3,199	1,247	38.98	1,913	897	46.89	2,589	901	34.80
Total (items 1 to 8)	4,653	2,701	58.05	3,123	2,107	67.47	3,883	2,195	56.53

2.7. Working population.

The classification of households according to means of livelihood indicated the relative importance of agriculture and other sources of income, but does not indicate the size of the economically active population or the labour force and its distribution between the various activities. Hence, the total population of the sample villages is divided into workers and non-workers. The main and subsidiary employments of the workers are also studied, the main employment of a worker being that in which he spends the maximum part of his time in a year. It may be noted from the following table No. 2.7. that the percentage of workers in the total population is nearly the same in all the three strata, being 54.6 per cent in S_1 , 55.8 per cent in S_2 , and 53.6 per cent in S_3 . There are however important differences between the cultivator (farm) households and non-cultivator households within each stratum as also between the three strata.

Among the cultivator households the number of workers per household (including adult and children of both sexes) is 2.77 in S_1 as compared with 3.04 in S_2 and 2.90 in S_3 . Among the non-cultivator households the number of workers per household is 2.10 in S_1 as compared with 2.06 in S_2 and 2.20 in S_3 . This shows that a cultivator household has more workers than a non-cultivator household. We also find that the number of workers per household steadily increases as the size of holding increases; the number of workers per household in the higher size groups being more than twice the same in the smaller size groups. (Census table No. 7).

The proportion of children in the working population is 2.6 per cent in S_1 as compared with 4.0 per cent in S_2 and 4.3 per cent in S_3 . No noticeable difference is to be found however in respect of the employment of adult women. Generally speaking, adult female worker contributes about 40.0 per cent to the total labour force as compared with about 57.0 per cent contribution by adult male worker in all the three strata. The number of adult non-workers per household is nearly the same in all the strata being one person for two households. These details may be seen in table No. 2.7.

Table No. 2.7.

Workers and Non-workers

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
1. Percentage of workers in the total population	54.6	55.8	53.6
2. No. of workers per household	2.49	2.72	2.60
3. Number of adult non-workers per household	2.07	2.15	2.25
4. Number of adult non-workers per household	0.58	0.56	0.55
5. No. of workers per cultivator household	2.77	3.04	2.90
6. No. of non-workers per cultivator household	2.23	2.28	2.46
7. No. of workers per non-cultivator household	2.10	2.06	2.20
8. No. of non-workers per non-cultivator household	1.86	1.90	1.97
9. Percentage of children in the total	2.6	4.0	4.3
10. Percentage of adult female workers in the total workers	40.1	39.5	38.1
11. Percentage of adult male workers in the total workers	57.4	56.4	57.7

The distribution of workers belonging to the cultivator households under the main classes of employment and according to the size groups of holdings is shown in Census table No. 8. It is interesting to find from this table that the workers having owner-cultivation and tenant cultivation as main employment constitute the highest proportion in the middle size groups of holdings. Agricultural labour is of importance only in the lower size groups, while annual farm servant labour is of importance only in the higher size groups. Non-agricultural employments are found to be decreasing in their importance as the size group of holdings increases.

2.8. Size and distribution of owner holdings.

In S₁ villages, about 65 per cent of the total number of households own land. In S₂ villages the households owning land constitute nearly 78 per cent. In S₃ the percentage is about 69. Thus, a high proportion of the households own land in all the three strata. There are however significant differences between the three

bution of owner holdings, as may be seen in table No. 2.8. The average size of owner holding in S_1 is 6.46 acres as compared with 8.97 acres in S_2 and 9.70 acres in S_3 . We find however that there is greater inequality in the distribution of land ownership in S_1 as compared with S_2 and S_3 . If we take the first three size groups of holdings (5 acres and below), 61 per cent of the holdings own 20 per cent of land in S_1 , while the proportion of the number of holdings and the extent of land owned respectively come to 51 per cent and 14 per cent in S_2 , and 50 per cent and 13 per cent in S_3 . In the higher size groups (above 10 acres), 19 per cent of the holdings own 58 per cent of the extent of land in S_1 , 27 per cent of holdings own 68 per cent of the extent of the land in S_2 , and the same percentage of holdings own 69 per cent of the extent of land in S_3 .

Table No. 2.8

Size and distribution of owner holdings

Size groups of holdings (acres)	S_1		S_2		S_3	
	No. of holdings %	Extent of land owned %	No. of holdings %	Extent of land owned %	No. of holdings %	Extent of land owned %
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Below 5.01	61	20	51	14	50	13
5.01 - 10.00	20	22	22	18	23	18
Above 10	19	58	27	68	27	69
	100	100	100	100	100	100
Average size of owner holding (in acres)	6.46		8.97		9.70	

A classification of the owner holdings under three heads, namely (i) uncultivated area (ii) grazing land and (iii) cultivated area, shows that the extent of grazing land is considerable in all the three strata. (Census table No. 10). It is as high as 14.84 per cent in S_3 as compared with 9.40 per cent in S_2 and 6.78 per cent in S_1 . In all the three strata the proportion of grazing land

to the total extent of owner holding increases rapidly as the size of holding increases. The extent of uncultivated land comes to 1.02 per cent in S₁, 5.00* per cent in S₂ and 0.43 per cent in S₃. The proportion of uncultivated land is found to be more or less the same in all the size groups.

The percentage of the extent of owner holdings having irrigation facilities is not inconsiderable in S₃, accounting for 6.1 per cent of the cultivated area. It comes to 5.6 per cent in S₂ and 2.6 per cent in S₁. Irrigated area is to be found in all the size groups of holdings; but it is relatively high in the first two size groups in all the three strata.

The extent of leased-out land (including land given out on usufructuary mortgage) comes to 12.6 per cent in S₁, 10.8 per cent in S₂ and 10.0 per cent in S₃. In all the three strata the ratio of leased-out land to total holding is comparatively high in the smaller size groups of holdings. Details may be seen from the following table.

Table No. 2.9.

Owner holdings - Land use, irrigated area and leased-out area.

	S ₁	S ₂	S ₃
Grazing land as percentage of holding	6.78	9.40	14.84
Uncultivated area as percentage of holding	1.02	5.00	0.43
Irrigated area as percentage of cultivated land	2.6	5.6	6.1
Leased-out land as percentage of holding	12.6	10.8	10.0

Foot Note: * This high proportion is due to the uncultivated area in the highest size group of holding being nearly 25 per cent.

2.9. Size and distribution of operational holdings.

The average size of an operational holding (including leased-in land and current fallows, but excluding grazing land) is 6.81 acres in S_1 . This comes to 8.84 acres in S_2 and 9.94 acres in S_3 . The distribution of cultivator holdings according to the size groups of holdings has the same features as the distribution of owner holdings, and underlines the fact that there is greater inequality in S_1 as compared with S_2 and S_3 . The relevant data are given below.

Table No. 2.10.

Distribution of Operational Holdings

Size group of holdings (acres)	S_1		S_2		S_3	
	No. of holdings %	Extent operated %	No. of holdings %	Extent operated %	No. of holdings %	Extent operated %
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Below 5.01	57	18	46	12	41	11
5.01 - 10.00	29	23	24	20	29	21
Above 10.00	14	59	30	68	30	68
	100	100	100	100	100	100
Average size of holding (in acres)	6.81		8.84		9.94	
Percentage of leased-in land in the holding	14.1		8.5		7.5	

The proportion of leased-in lands (including poramboke lands and lands taken on usufructuary mortgage) in the total extent of operated area comes to 14.1 per cent in S_1 as compared with 8.5 per cent in S_2 and 7.5 per cent in S_3 . The ratio of leased-in land to total operated area is found to be comparatively high in the higher size groups of holdings. (Census Table No. 11).

2.10 Fragmentation of operational Holdings.

Fragmentation of operational holdings, particularly of holdings which are below one or two acres in size, is considered as a weakness of farm structure in India. In all the strata, the number of fragments per acre decreases rapidly as the size of holding increases

(census table No. 12). It is however worth noting that the single fragment holdings dominate the first size group of holdings of one acre and below. In the second size group of holdings also (1.01 to 2.50 acres) single fragment holdings dominate, double fragment holdings being next in order of importance. The salient features of fragmentation of holdings are indicated below in Table No. 2.11.

Table No. 2.11.

Fragmentation of Holdings

Size groups of holdings (acres)	S ₁	S ₂	S ₃
<u>0.01 - 1.00</u>			
(a) Fragments per acre	1.60	1.78	1.35
(b) Percentage of single fragment holding	91.9	86.3	94.6
<u>1.01 - 2.50</u>			
(a) Fragments per acre	0.86	0.95	0.75
(b) Percentage of single fragment holding	57.7	47.8	63.9
(c) Percentage of double fragment holdings	31.2	36.3	30.7
Overall fragments per acre	0.46	0.51	0.29

2.11. Soils, Cropping Patterns and Crop Yields.

The Project area commanded by the Right Bank Canal is flat open plain of low elevation, broken by a few low hills here and there. There are no forests worth mentioning in this area. The average annual rainfall in the area is about 35" and most of it is received between the months of June and November. The showers received in May and June help the farmers to raise early crops, but there is the risk of failure of crops unless the rains in October and November are frequent and adequate, and the North-east monsoon is favourable during these months. In the area covered by the taluks of Palnad, Vinukonda, Narsaraopet and Sattenapalle where there is a considerable extent of red soil and the subsoil rocky, draught is frequently felt because of lack of adequate rainfall at short intervals. The incidence of draught is not so much where black soil predominates as in most parts of the

Right Bank Canal area. All these soils are quite suitable for irrigation. At present, however, only a small proportion of the area is under well or tank irrigation. In contrast with the area commanded by the Right Bank Canal, the area commanded by the Left Bank Canal has all the disadvantages of the rugged and undulating topography of the Telengana region. The soil varies a good deal mostly in colour and texture from place to place but it is mostly reddish brown to brownish, red sandy loam known as 'chalkas.', which is poor in plant nutrient reserves. Patches of black soil are also to be found widely dispersed in the region, especially in low valleys and tracts of even topography. The existence of numerous tanks for irrigation, practically in every village, which are used for storing rain water, is a consequence of the topography of the area. The cropping pattern of these areas has been largely influenced, by these soil, climatic and other physical factors.

The crop pattern or the distribution of the cropped area among the various crops raised is given in the table No. 5 (Farm Surveys) and the percentage distribution of the cropped area under various crops is given in table No. 6 (Farm Surveys). The leading crops in S_1 villages are jowar (28.09%), variga (21.95%), and virginia tobacco (11.24%). The area under the four important commercial crops raised in S_1 villages viz., tobacco, chillies, groundnut and cotton constitutes 32.11% of the total cropped area. The leading crops in the S_2 villages are jowar (27.35%), Variga (24.43%), Bajra (20.81%) and groundnut (6.47%). The area under five important commercial crops viz., tobacco, chillies groundnut, cotton and castor, constitutes 15.29% of the total cropped area. In contrast with S_1 and S_2 villages, the leading crops in the S_3 villages are Jowar (43.39%), pulses (18.69%) and groundnut (15.61%). The area under the important commercial crops viz., groundnut, chillies, castor, tobacco and cotton constitutes 18.99% of the total cropped area. Virginia tobacco is an important crop only in S_1 villages. The cereal crop jowar (pure and mixed) is an important crop in all the three strata, while variga is an important crop only in the S_1 and S_2 villages. Chillis is an important crop only in S_1 villages.

Mixed cropping is a common feature of all the strata, the mixtures varying from one stratum to another. The most common mixtures in S_1 villages are groundnut+redgram or cotton or castor, jowar+redgram or greengram, bajra+redgram or castor, and dry paddy+redgram. In S_2 villages these mixed crops are even more extensively cultivated, and there is a greater variety of mixtures. In S_3 villages the main mixture are groundnut+ pulses, jowar+pulses and mixtures of pulses. The area under mixed crops in S_1 villages constitutes 18.85% of the total cropped area as compared with 45.96% in S_2 villages and 33.97% in S_3 villages. Mixed cropping is thus not as important in the S_1 villages where the commercial crops are important, as in S_2 and S_3 villages. Some important features of the cropping pattern are indicated below.

Table No. 2.12.

Crop Pattern: Percentage Distribution of Area under crops.

	S_1	S_2	S_3
Area under commercial crops	32.11	15.29	18.99
Cereals and others	67.89	84.71	81.01
Total	100.00	100.00	100.00
Area under mixed crops	18.85	45.96	33.97
Pure crops	81.15	54.04	66.08
Total	100.00	100.00	100.00

Information about crop yields collected through our Farm surveys for the year 1959-60 is given in the following table No. 2.13. It is clear from the data presented that crop yields are generally higher in S_1 and S_2 i.e., on the Right Canal side, as compared with the yields in S_3 i.e. on the Left Canal side. In the case of almost all the dry crops both food crops and commercial crops, the yields in S_3 are significantly less, a feature which

has to be attributed to the comparatively inferior quality of soils and cultural practices, prevailing in S₃ villages. This fact is also borne out by the data on average crop yields given in the Season and Crop Reports of Andhra Pradesh. The relevant information for the districts of Guntur, Nalgonda and the State of Andhra Pradesh for the year 1958-59 and 1959-60 are given in the foot note.

Table No. 2 13.

Crop yields in 1959-60 in Maunds per acre

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
Paddy (irrigated)	21.24	14.13	22.61
Jowar	5.92	4.47	3.72
Bajra	3.71	6.98	1.58
Variga	7.72	7.13	4.86
Paddy (unirrigated)	6.18	7.32	--
Groundnut	6.18	7.32	4.45
Cotton	1.72	2.05	1.64
Country tobacco	5.09	6.41	5.54
Castor	--	1.54	1.49
Chillies	3.82	8.01	1.55

N.B. 1 maund = 82 2/7 lbs.

Foot note:

Average yields per acre (in lbs.)

	1958-59			1959-60		
	Guntur district	Nalgonda district	State (Andhra Pradesh)	Guntur District	Nalgonda District	State (Andhra Pradesh)
Rice	1,515	1,015	1,116	1,229	876	1,111
Jowar	440	361	492	507	414	506
Bajra	331	295	474	400	309	446
Gram	450	189	261	425	198	233
Groundnut	1,008	440	843	896	319	817
Castor	200	195	150	225	219	173
Cotton(Lint)	72	35	61	85	--	56

Source: Season and crop reports of Andhra Pradesh.

2.12. Agricultural practices:

Preliminary agricultural operations like ploughing harrowing etc. are generally commenced as early as April and May and with the onset of the South-West monsoon in the month of June, the seed is sown. Dry paddy, groundnut, and other oilseed crops are the crops usually raised as first season crops. Jowar and bajra are also sown during this season but a good proportion of these crops is used as cattle fodder. Redgram is also usually sown in this season as a pure crop or more generally as a mixed crop. Commercial crops like chillies and tobacco and food crops like variga and jowar are sown in the months of September and October and if these crops are not preceded by any crop sown during June-July, the preliminary agricultural operations and manuring for these crops take place in the months of August and September. Irrigated paddy which is an important crop in S_3 villages is also sown in the months of June-July and in these villages, a second crop of paddy is also some times raised as a summer crop.

Most cultivators in the Project area as in in other parts of the country, use a part of the produce of the previous years for seed purposes in the case of most of the crops. The practice of purchase and sale of seed in the market varies according to the degree of monetisation of the economy, which to some extent depends on the importance of commercial crops. For instance, it is found in our Farms Surveys that farmers' cash expenditure on seed (or seedlings) constitute 71% of the total value of seed in S_1 villages as compared with 47.5% in S_2 and 31.1% in S_3 villages (Farm surveys Table No. 49). It is found that in many villages, the use of improved seed is still a rarity particularly for food crops.

The methods of cultivation are still predominantly traditional, and ploughing, harrowing etc. are done with traditional equipment. Lack of finance, smallness of the farm size, fragmentation of the holding, and lack of knowledge of improved methods are some of the main factors which stand in the farmers' way of adopting improved implements and other cultural practices. Manuring of crops is also not a developed feature of the farming in the villages except in

in the case of important commercial crops. Farm yard manure is still the most common type of manure used. Preparation of compost and green manure is rarely practised by the cultivators. Chemical fertilisers like superphosphate and ammonium sulphate and Urea are used by some cultivators for selected crops like tobacco, chillies and groundnut and in a small number of cases in irrigated paddy in S_3 villages. The use of pesticides is found only in some cases of farmers raising chillies and tobacco. Crop rotations are an important feature of farming in the villages which have the object of maintaining the fertility of the soil to some extent. For instance some of the important crop rotations are unirrigated paddy or jowar followed by tobacco, groundnut followed by variga or jowar, or bajra, jowar, variga, bajra rotation, bajra followed by cotton etc. These crop rotations are followed by farmers according to their experience and tradition and it is difficult to say how far they are scientific and rational.

2.13. Marketing and credit:

Most farmers are found to take their surplus produce to regulated market yards or traders in towns directly, especially the surplus produce of commercial crops. The existence of regulated markets in S_1 and S_2 villages, is a great facility to the farmers in this region. In S_3 there are regulated markets for all important crops and many farmers are found to take advantage of these markets. The produce of food crops appears to be consumed mostly in the local area itself except in the case of irrigated paddy in S_3 to some extent. Merchant traders and commission agents however play an important role in the marketing of the agricultural produce of the villages. The practice of giving loans to cultivators at the time of sowing and purchasing the harvested produce at prices stipulated in advance is still common among these trade agencies. The role of cooperative marketing societies in the villages surveyed is negligible.

As regards the availability of credit for farmers in the villages to meet their short term and long term needs it is found that the field is still dominated by agricultural money lenders and professional money lenders, the role of cooperatives and Government being negligible. Cooperative credit societies are functioning in several villages but their contribution to credit supply to farmers is very inadequate and the working of most of the societies is unsatisfactory. The rates of interest charged by the money lenders varied from 12 to 24 percent.

2.14. Agricultural and other assets owned by cultivator and non-cultivator households.

Land is the major agricultural asset owned by the rural households in all parts of India. Assets in the form of buildings, implements and work cattle constitute only a small proportion of the total assets. This is one of the conspicuous ~~xxxxxxxxxx~~ features of agriculture in India. The distribution of the major classes of agricultural assets held by the cultivator households according to the size-groups of holdings, and the assets owned by the non-cultivator households are given in Census Table No. 13. The value of agricultural assets including land comes to Rs.9,110 per cultivator household and Rs.1,008 per non-cultivator household in S₁. In S₂, it amounts to Rs.6,180 per cultivator household and Rs.848 per non-cultivator household. The value of agricultural assets in S₃ is slightly higher than in S₂ per cultivator household (Rs.6,215) and slightly less than in S₂ per ^{non-}cultivator household (Rs.719). If we exclude land, the value of agricultural assets per cultivator household comes to only Rs.757 in S₁, Rs.536 in S₂ and Rs.664 in S₃; and per acre of operated area it comes to Rs.111 in S₁, Rs.62 in S₂, and Rs.66 in S₃. In our Census Survey, information is also collected about two other categories of assets for these households, namely milch animals and other live stock, and residential buildings. The value of milch animals and other livestock per cultivator household comes to Rs.212.75 in S₁ as compared with Rs.219.42 in S₂ and Rs.275.46 in S₃. The value of residential buildings per cultivator household comes to Rs.1,496 in S₁, Rs.624 in S₂ and Rs.865 in S₃.

If we take the non-cultivator households into consideration we find that the value of milch animals and other live-stock is comparatively small, being Rs.45 in S₁, Rs.72 in both S₂ and S₃. The value of residential buildings per household is approximately 50 per cent of the same per cultivator household. The relevant details are given in the following Table No. 2.14.

Table No. 2.14.

Agricultural and other assets.

	S ₁ Rs.	S ₂ Rs.	S ₃ Rs.
<u>Cultivator households:</u>			
(a) <u>Agricultural assets:</u>			
i) Value per household (including land)	9,110	6,180	6,215
ii) Value per household (excluding land)	757	536	664
iii) Value of land per household	8,353	5,644	5,552
iv) Value of land per acre	1,240	638	558
v) Value of assets excluding land, per acre	111	62	66
(b) <u>Other assets:</u>			
i) Value of milch animals and other livestock per household	213	219	276
ii) Value of residential buildings per household	1,496	624	865
<u>Non-cultivator households:</u>			
(a) <u>Agricultural assets:</u>			
Value of assets per household			
i) including land	1,008	848	719
ii) excluding land	15	11	16
(b) <u>Other assets:</u>			
i) Value of milch animals and other livestock per household	45	72	72
ii) Value of Residential buildings per household	749	354	372

2.15. Liabilities of farm households:

Particulars of the financial liabilities of the sample farm households are given in the tables Nos. 14 to 17 (Farm Surveys). It may be seen from these tables that 51.7% of the farm household have financial liabilities at the beginning of the year and the percentage has increased to 59.3 at the end of the year in S₁ villages. In S₂ villages, 47.92% of the farmers are in debt at the beginning of the year and the percentage has increased to 57.5 at the end of the year. In S₃ villages also, 53% of the farmers are in debt at the beginning of year and 77% at the end of the year.

Professional money lenders and agricultural money lenders are the major sources of borrowed money for the farmers. It may be seen from the table No. 14 (Farm Surveys) that more than 90 percent of the amount borrowed by the farmers is taken from money lenders in all the strata. It is at the same time a significant feature of indebtedness that nearly 50 per cent of the debt is incurred for productive agricultural purposes. The indebtedness per farm is highest in S₁ villages, which amounts to Rs.754 as compared with Rs.387 and Rs.612 in the S₂ and S₃ villages respectively. Details are given below.

Table No. 2.15.

Liabilities of Farm Households.

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
<u>Percentage of Farm in debt</u>			
At the beginning of 1959-60	51.4	47.9	53.0
At the end of 1959-60	59.3	57.5	77.0
<u>Percentage of borrowings from</u>			
Professional money lenders	37.00	50.50	34.97
Agricultural money lenders	54.06	48.15	54.48
Others	8.94	1.35	10.55
<u>Indebtedness(in Rs.)</u>			
Per farm	752.8	380.8	611.8
Per acre	95.6	39.2	64.1
Percentage of borrowing for agricultural purposes to total	55.55	45.59	47.88
Percentage of amount borrowed for agricultural purposes to paid out cost of cultivation per acre during 1959-60	13.29	4.71	10.91

2.16. Growth of cattle population.

The population of draught cattle in S₁ villages according to our Census Survey comes to 2188 in 1959 as compared with 2152 in 1954 (Census Table No. 14). The annual rate of increase thus comes to a low percentage of 0.33. In S₂ villages the numbers increased from 2083 in 1954 to 2218 in 1959, the annual growth rate being 1.29 percent. In both S₁ and S₂ we find that the population of buffaloes increased and that of bullocks decreased. In S₃ the numbers increased from 3275 to 3658 during this period, amounting to an annual rate of growth of 2.34 per cent, and we find that in this stratum both categories of animals increased in number. In S₁ and S₂ the number of work cattle per cultivator holding in 1959 has come to 0.81 and 1.07 respectively, as compared with 1.69 in S₃. Our Census Survey data thus reveal that on average a household maintains more work cattle in S₃ than in S₁ and S₂; and also that their growth rate is considerably greater than in S₁ and S₂. The number of milch cattle and of young stock available per cultivator household in 1959 and their growth rates for the period 1954-59 are also shown in the table. It may be seen that in respect of these two categories of cattle the position in the three strata is not materially different from the position of draught cattle we have discussed above.

Table No. 2.16
Growth of cattle population

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
1. Draught cattle per cultivator household	0.81	1.07	1.69
2. Annual growth rate of draught cattle (1954-59)	0.33	1.29	2.34
3. <u>Milch cattle per</u>			
(a) Cultivator household	1.34	1.41	2.10
(b) Non-cultivator household	0.24	0.39	0.49
4. <u>Young stock per</u>			
(a) Cultivator household	0.87	0.94	1.65
(b) Non-cultivator household	0.19	0.29	0.39
5. Annual growth rate of milch cattle	2.04	2.87	2.48
6. Annual growth rate of young stock	1.38	2.09	2.56

2.17. Population of sheep and goats.

The rearing of sheep and goats along with work animals and milch cattle is an important feature of the rural economy in the Project area. The number of sheep and goats maintained by the

cultivator and non-cultivator household and their growth rates during the period 1954-59 may be seen from the following table.

Table No. 2.17

Population of sheep and goats.

	S ₁	S ₂	S ₃
<u>Per household:</u>			
Cultivator	0.97	2.08	1.63
Non-c ltivators	0.56	0.93	1.11
Annual growth rate (1954-59)(all households)	2.97	- 0.96	5.01

2.18. Resources available to cultivator households.

(a) Land: As indicated earlier, the average size of a cultivator holding in S₁ villages is 6.81 acres as compared with 8.84 acres and 9.94 acres in S₂ and S₃ villages respectively. The average size of a cultivator household is also however larger in S₃, comprising 5.37 persons as compared with 5.00 persons in S₁ and 5.32 persons in S₂. The per capita operated area thus comes to 1.36 acres in S₁, 1.66 acres in S₂ and 1.85 acres in S₃. This is, however, only an average picture. A high proportion of the cultivator households constituting more than fifty per cent, do not in fact possess holdings of even half the average size in any stratum. The extent of area irrigated under wells or tanks comes to 3.53% of the cultivated area in S₁, 5.12% in S₂ and 7.61% in S₃. The extent per household becomes a small fraction of the holding, being 0.24 acres in S₁, 0.45 acres in S₂ and 0.76 acres in S₃. The extent of grazing land available to the cultivator households in addition to the cultivated area, comes to 0.49 acres in S₁, 0.96 acres in S₂ and 1.70 acres in S₃. The relevant figures are given below.

Table No. 2.18.

Land Resource

	S ₁	S ₂	S ₃
1) <u>Size groups of holdings:</u>			
0.01 - 1.00 Acres: Average size :	0.68	0.68	0.79
Percentage of holdings	18.00	12.7	7.8
1.01 - 2.50 acres: Average size	1.80	1.81	1.99
Percentage of holdings	18.7	14.3	12.6
2.51 - 5.00 acres: Average size:	3.70	3.82	3.92
Percentage of holdings	20.2	19.5	20.2
Overall Average size	6.81	8.84	9.94
2) Operated area per capita (acres)	1.36	1.66	1.85
3) Irrigated area per holding (acres)	0.24	0.45	0.76
4) Grazing land per holding (acres)	0.49	0.96	1.70

B) Man-power: The number of agricultural workers per cultivator holding (main employments being owner cultivation, tenant cultivation and agricultural labour, and including adults and children of both sexes) comes to 3.23 persons in S₁, 3.36 in S₂ and 3.83 in S₃. The number of workers per acre of operated area comes to 0.48, 0.38 and 0.39 in the three strata respectively. We find thus that there is more labour employed per acre in cultivation in S₁ than in S₂ or S₃.

Table No.2.19
Manpower Resources

	S ₁	S ₂	S ₃
No. of agricultural workers per holding	3.24	3.36	3.83
No. of agricultural workers per acre of holding	0.48	0.38	0.38
No. of cultivator household agricultural workers per holding.	2.36	2.70	2.70
-do- -do- Per acre	0.35	0.31	0.27
No. of cultivator household non-agricultural workers per holding	0.43	0.40	0.28

C) Work cattle: The number of work cattle owned by the cultivator households comes to 0.81 per operational holding in S₁, 1.07 in S₂ and 1.69 in S₃. If we take the size of the holding into consideration the number of work cattle per acre comes to 0.119 in S₁, 0.121 in S₂ and 0.170 in S₃. We find thus that there are more work cattle available for cultivation in S₃ as compared with S₁ and S₂, the number of acres commanded by a pair of work cattle being 11.8 in S₃ as compared with 16.7 and 16.5 respectively in S₁ and S₂.

Table No. 2.20.

Work cattle resource

	S ₁	S ₂	S ₃
<u>No. of work cattle:</u>			
i) per holding	0.81	1.07	1.69
ii) per acre	0.119	0.121	0.170
No. of acres per pair of work cattle	16.7	16.5	11.8

D) Agricultural implements and carts: The number of work cattle per plough among the cultivator households comes to 1.68 both in S₁ and S₂, and 1.72 in S₃. The position in this respect is thus practically identical in all the strata. The number of carts per cultivator household is almost the same in all the three strata. Further it is a matter of considerable interest to find that there is a fixed relationship between number of ploughs and work cattle; and also between numbers of carts and of cultivator households. The actual number of ploughs, other implements and carts are given below:-

Table No. 2.21

Agricultural implements and carts

	S ₁	S ₂	S ₃
Number of ploughs	1,301	1,326	2,130
Number of carts	920	714	777
Number of harrows	1,327	1,208	1,641
Number of drills	1,344	1,178	1,635
Number of work cattle per plough	1.68	1.68	1.72
Number of carts per cultivator household	0.34	0.34	0.35

We find thus that more resources per head are available for use in cultivation, in quantitative terms, in S_3 as compared with S_1 and S_2 . The operated area per head in S_3 is 1.85 acres, while it is 1.66 acres in S_2 and 1.36 acres in S_1 . The extent of area irrigated under wells and tanks per holding is 0.76 acres in S_3 as compared with 0.45 acres in S_2 and 0.24 acres in S_1 . The number of agricultural workers per holding is 3.83 persons in S_3 while it is 3.36 persons in S_2 and 3.24 persons in S_1 . The area commanded by a pair of work cattle is 11.8 acres in S_3 as compared with 16.5 acres in S_2 and 16.7 acres in S_1 . The number of work cattle per plough is practically the same in all the strata. The resource position in S_3 is thus more favourable, but the resources are poor in quality as compared with the resources available in S_1 or even in S_2 . As we have already seen, the soil in S_1 is predominantly black soil while it is mostly red soil in S_3 . The cattle stock of the Guntur District is of much higher quality than that of Nalgonda district. The farmers in the Guntur district are in a better position to raise commercial crops than the farmers in Nalgonda.

2.19. Employment and unemployment of workers.

Particulars of employment of family labour force and Annual servants are given in the Tables Nos. 20 to 25 (Farm Surveys). Employment has been broadly classified into 6 types, namely crop production, farm work other than crop production, exchange or gift labour, hired out for agricultural purposes, hired out for non-agricultural purposes and employment in business or service. Farm work other than crop production includes employment in the maintenance of cattle, and other types of work such as fencing, bunding and rope making which are related to farm work but are not directly included in the operations of crop production. Employment in business or service includes employment in all types of non-farm activities in which family members and annual servants are productively engaged. It may also be noted in this connection that employment is measured in 8 hr. days for the purpose of our study.

a) Employment of adult male workers: It may be seen from the table No. 20 (Farm Surveys) that on average an adult male member

of the farm family is employed for 219.8 days in S_1 villages, 226.5 days in S_2 villages and 230.6 days in S_3 villages which comes to about 7 to 8 months of employment in the year. Employment in agricultural work comes to 166.8 days in S_1 villages as compared with 168.5 days in S_2 villages and 189.2 in S_3 villages. Non-agricultural employment, amounting to 24.1 percent in S_1 villages, 25.6 percent in S_2 villages and 17.9 per cent in S_3 villages. It is worth noting in the connection that the total employment of an adult male member of the farm family decreases considerably as the size group of the holdings increases in all the three strata. In S_1 villages, an adult male member is employed for 284 and 253 days in the year in the lower two size groups respectively as compared with employment of 157 and 183 days in the highest two size groups. Similarly, in S_2 villages the Number of days of employment comes to 260 and 240 in the lower two size groups as compared with 211 and 182 in the last two size groups. The trend in S_3 villages is however, not as prominent as in S_1 and S_2 villages.

It is also interesting to note that employment in crop production and in farm work other than crop production taken together is comparatively low in the lower size groups in all the three strata. For instance, in S_1 villages, employment in crop production and other farm work is below 117.5 days in the lower four size groups compared with the maximum of 184.8 and minimum of 133.3 days in the other higher size groups. In S_3 villages the maximum employment in the lower 3 size groups is 147.8 days as compared with the range between 209 and 158.7 days in the other higher size groups. This feature of employment in crop production and farm work other than crop production is in contrast with the trend of total employment between the size groups; and it has to be attributed to two factors viz., (1) the average size of the holding in the lower size groups is not big enough to provide adequate employment for the adult male members of the farm families and (2) the inability of the farmers in these size groups to maintain large number of cattle. These factors also explain another interesting feature of the employment pattern. The number of days of employment hired out for agricultural purposes as well as ~~we~~ for non-agricultural purposes decrease rapidly as the

size group of holdings increases in all the three strata. The number of days of employment in business or service is comparatively high in the lower size groups. It is a general feature of the employment pattern that in the holdings below 5 acres each in size, the adult male members of the farm families depend a great deal more on non-agricultural activities for employment.

Table No. 2.22

Employment of an adult male worker

Size group (in acres)	S ₁		S ₂		S ₃	
	Employment in crop produc- tion and farm work other than crop pro- duction (8 hr. days)	Total (8 hr. days)	Employment in crop production and farm work other than Crop production (8 hr. days)	Total (8 hr. days)	Employment in crop production and farm work other than crop production (8 hr. days)	Total (8 hr. days)
0.01-1.00	67.1	284.4	44.7	260.2	87.1	253.3
1.01-2.50	72.6	252.7	46.7	240.0	108.3	221.1
2.51-5.00	100.5	216.4	80.9	221.8	147.8	248.6
Over-all	125.0	219.8	127.7	226.5	158.6	230.6

b) Employment of adult female worker: The total employment of an adult female worker of the farm families in S₁ villages comes to 173.7 days in the year as compared with 219.8 days of employment for adult male worker. In the S₂ villages the total employment per adult female worker comes to 175.9 days as compared with 226.5 days of employment for the male workers. In the S₃ villages it is considerably less than in S₁ and S₂ villages, and amount to 157.1 days as compared with 230 days of employment per adult male worker. We find thus that the total employment of an adult female worker is considerably less than that of an adult male worker in all the three strata.

The general pattern of employment of an adult female worker differs from the pattern of employment of an adult male worker in two important respects. Firstly, as a rule in all the three Strata, the proportion of employment in crop production and other farm work in the total employment is considerably higher for the female

worker. Secondly, there is great difference in respect of the ratio of employment in crop production to employment in farm work other than crop production. So far as the male worker is concerned, the number of days of employment in farm work other than crop production is $\frac{1\frac{1}{2}}{2}$ to $\frac{2}{4}$ times the number of days of employment in crop production; on the other hand in the case of an adult female worker, employment in farm work other than crop production is 5 to 6 times more than employment in crop production. This shows that woman workers are mostly engaged in dairying and cattle maintenance.

Table No. 2.23.

Employment in 8 hr. days of male and female workers

	Total		Crop production		Farm work-other than Crop production.	
	No.	%	No.	%	No.	%
<u>Stratum - 1.</u>						
Male worker	219.8	100	41.5	18.9	83.6	38.0
Female worker	173.7	100	17.3	9.9	106.3	61.2
<u>Stratum - 2.</u>						
Male worker	226.5	100	46.8	20.6	80.9	35.7
Female worker	175.9	100	19.8	11.2	115.0	65.4
<u>Stratum - 3.</u>						
Male worker	230.6	100	60.9	26.4	97.7	42.4
Female worker	157.1	100	15.4	9.8	71.7	45.7

c) Employment of ~~xxxxx~~ child worker: The total employment for a child worker has come to 129.0 days per year in S₁ villages as compared with 179.3 in S₂ villages and 181.4 in S₃ villages. The number of days of employment in farm work other than crop production constitutes 78.0 to 94.2 per cent of the total employment. It is a curious feature of the pattern of employment of children that a child works for more days in the year than the adult female worker in S₂ and S₃ villages, as shown in the following table.

Table No. 2.24.

Employment of child worker in S₁, S₂ and S₃ villages

Table No. 2.24.

<u>Employment of Child worker (in 8 hr. days)</u>			
	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
Male worker (Adult)	219.8	226.5	230.6
Female worker (Adult)	173.7	175.9	157.1
<u>Child worker</u>			
Total	129.0	179.3	181.4
Employment in crop production as % in the total.	78.0	81.3	94.2

d) Employment of annual farm servant: The total employment of an annual farm servant comes to 287.1 days in the year in S₁ villages ~~xxxx225xxxx~~ as compared with 286.0 in S₂ villages and 225.4 in S₃ villages, which shows that he is fully employed. The annual farm servant thus works for more days in the year than any other member of the farm household in S₁ and S₂ villages. The pattern of the employment of the annual farm servant differs from the pattern of employment of other members of the household in certain important respects. In the first place, annual farm servants are not employed by farm households in the lower size groups of the holdings. Secondly they are employed almost entirely for crop production and farm work other than crop production. Thirdly, in all the three strata, an annual farm servant work for crop production for 35 to 56 days each more than an adult male worker of the family, and for farm work other than crop production, he works for 31 to 99 days more.

Table No. 2.25.

<u>Employment of annual farm servants (in 8 hr. days)</u>			
	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
<u>Annual farm servant:</u>			
Total	287.1	286.0	225.4
Crop production	96.0	95.9	95.9
Farm work other than crop production	162.8	179.5	128.7
<u>Adult male worker:</u>			
Total	219.8	226.5	230.6
Crop Production	41.5	46.8	60.9
Farm work other than crop production	83.6	80.9	97.7

2.20. Employment and unemployment of work animals:

55

Details relating to employment of work animals maintained by the sample households are given in table No. 29 (Farm Surveys). The employment of work animals is classified into 6 categories on the same lines as the employment of workers i.e., employment in crop production, employment in farm work other than crop production, etc. It will appear from the table that a pair of work animals is employed only for a total number of 115.5 8 hr. days in the year in S₁ villages as compared with 102.4, and 79.5 days in S₂ and S₃ villages ~~compared with~~ respectively. This shows that the problem of underemployment of work animals is a serious problem in comparison with the underemployment of workers, as the farmers are maintaining cattle for 250 to 285 (8 hr. days) in the year without taking any service in return. The problem appears to be more serious in S₃ villages than in S₁ villages, or even in S₂ villages to some extent. The comparatively high degree of underemployment in S₃ villages is due to the fact that the number of work animals, per farm as well as per acre, in S₃ villages is considerably more than in S₁.

The pattern of employment of work animals in the three strata shows that 62.3 percent of the total number of days worked is for crop production in S₁ villages as compared with 72.1 percent in S₂ villages and 83.2 percent in S₃ villages. Employment for farm work other than crop production constitutes a very small proportion of total employment. Employment under the 2 categories, exchanged or gifted and hired out for agricultural purposes constitutes 25.9 percent of the total employment in S₁ villages, 23.2 percent in S₂ villages and 7.1 percent in S₃ villages. Employment under the category hired out for non-farm work is 7.8 percent of the total employment in S₁ villages and it is negligible in the other two strata.

The distribution of employment of work animals according to size groups of holdings shows clearly that the number of days of employment in crop production per pair of work animals increases rapidly as the size group of the holding increases, while the trend is reversed in the case of employment under the categories exchanged or gifted and hired out for agricultural purposes. These trends are explained by the fact that in the lower size groups of holdings

the average size of the cultivator holding and average number of work animals per farm are lower than in the higher size groups.

Table No. 2.26

Employment of work animals (in 8 hr. work pair days)

	S ₁	S ₂	S ₃
Total employment	115.5	102.4	79.5
Employment in crop production XXXXXXXXXX	72.0	73.8	66.1
Percent to total	62.3	72.1	83.2
Exchanged or gifted or hired out for agricultural purposes (number)	29.9	23.8	5.6
Percent to total	25.9	23.2	7.1

2.21. Land improvement expenditure during 1954-55 to 1958-59.

In our census survey of the sampled villages all the enumerated cultivator and non-cultivator households are asked to give details of expenditure incurred by them on land improvement. Expenditure on land improvement has been classified under 7 heads namely: (1) prevention of erosion; (2) improvement of drainage; (3) reducing salinity (4) fencing (5) bunding and levelling (6) and reclamation, and (7) improvement of irrigation sources.

It will be seen from the table No. 2.27 below that during the period 1954-55 to 1958-59 (5 years), the total expenditure on land improvement incurred by the cultivator households comes to Rs.17.98 per household or Rs.2.65 per acre in S₁ villages. In S₂ villages, the expenditure per household is Rs.8.19 and expenditure per acre is Rs.0.94. In S₃ villages the expenditure per household is highest among the three zones and comes to Rs.21.85 and the expenditure per acre comes to Rs.2.22 which is slightly less than in S₁ villages.

In S₁ villages, 52.3 % of the expenditure on land improvement is incurred for improvement of irrigation sources like wells, etc, and 21.2 % of the expenditure on prevention of erosion. Expenditure on land reclamation comes to 14.1 % and expenditure on bunding and levelling to 9.9 %. In S₂ villages also, expenditure on improvement of irrigation sources and prevention of erosion are the most important items of expenditure, constituting 35.9 % and 22.0 % of the total expenditure respectively. Next in order of importance are

the expenditure on bunding and levelling, and land reclamation. In S_3 villages the pattern of land improvement expenditure happens to be very much different from the pattern observed in S_1 and S_2 villages. Expenditure on prevention of erosion, bunding and levelling and fencing are the most important items of expenditure in this stratum, accounting for 38.3 %, 18.6 % and 15.4 % of the total expenditure, respectively.

Table No. 2.27

Expenditure on land improvement 1954-55 to 1958-59.

Item of Expenditure	S_1		S_2		S_3	
	Amount Rs.	Percent	Amount Rs.	Percent	Amount Rs.	Percent
1. Prevention of erosion	10,296	21.20	3,790	21.96	18,339	38.25
2. Improvement of drainage	630	1.30	615	3.56	100	0.22
3. Reducing salinity of land	150	0.31	380	2.22	4,280	8.92
4. Fencing	467	0.96	1,355	7.85	7,382	15.39
5. Bunding and levelling	4,795	9.87	2,161	12.52	8,940	18.64
6. Land reclamation	6,838	14.09	2,145	12.43	3,730	7.78
7. Improvement of irrigation	25,385	52.27	6,810	39.46	5,180	10.80
Total	48,561	100.00	17,256	100.00	47,951	100.00
Per household	17.98		8.19		21.85	
Per acre	2.65		0.94		2.22	

2.22. Growth of capital assets during the period 1954-55 to 1958-59.

Details relating to changes in certain important types of assets owned by the cultivator and non-cultivatory households during the period 1954-55 to 1958-59 were also collected and presented in the table No. 15 (Census Survey). The following are the types of assets about which information is collected.

- | | |
|---------------------|---|
| i) extent of land; | iii) agricultural implements and machinery; and |
| ii) farm buildings; | iv) livestock including work animals, |

milk animals and others. The values of these different types of assets owned by the cultivator households in 1954-55 and 1958-59 are calculated at constant prices i.e., at the average prices of 1958-59. The difference between the estimates of assets for the two years constitutes increase or decrease in the real value of the assets that has taken place between the two years and it measures the excess of purchase over sales of land, cattle, and other assets, value of increase ⁱⁿ livestock, new constructions or improvements of farm buildings and additions to stocks of implements.

For the cultivator households, the annual average increase in assets comes to Rs.48.5 per household and Rs.6.13 per acre. Expressed as a proportion of the total net income received by the cultivator households in the year 1958-59, the growth of capital assets has been considerably less than in S₁ villages. The annual average increase comes to Rs.25.6 per household and Rs.3.00 per acre; and constitutes 4.43% of the net income received by the cultivator households in 1958-59. In S₃ villages, the annual average increase in capital assets is approximately twice the same per household as in S₁ villages while the increase in assets per acre is 1½ times the same in S₁ villages. In these S₃ villages, the growth of assets expressed as a proportion of the net income received by cultivator households in 1958-59, comes to 17.32% which is nearly 2½ times the increase in S₁ villages and 4 times ~~the~~ increase in S₂ villages. This is to be attributed to some extent to the comparatively low aggregate income in S₃ villages and the unusually high rate of increase reported in the extent of land held by the cultivators during the period 1954-55 to 1958-59.

Table No. 2.28.
Growth of capital assets during 1954-55
to 1958-59.

Cultivator households:

Item:	S ₁			S ₂			S ₃		
	Per household per annum (Rs.)	Per acre per annum. (Rs.)	% of am- ount in total income of 1958-59.	per h.h. per annum. (Rs.)	per acre per annum (Rs.)	% of amount in total income of 1958-59	Per h.h. per annum (Rs.)	per acre per annum (Rs.)	% of amount in total income of 1958-59.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Land	31.11	4.58	4.84	12.72	1.47	2.20	73.20	7.45	14.01
2. Farm buildings	11.77	1.73	1.83	5.57	0.64	0.96	2.84	0.29	0.54
3. Implements	0.70	0.10	0.11	1.32	0.15	0.23	1.62	0.16	0.31
4. Livestock	4.90	0.72	0.76	6.02	0.69	1.04	12.87	1.31	2.46
Total	48.48	6.13	7.54	25.63	2.95	4.43	90.54	9.21	17.32

2.23. Farm and non-farm activities.

It has been pointed out earlier in Section 2.6 dealing with the distribution of households under various livelihood classes (main and subsidiary), that a household in rural areas has generally more than one means of livelihood. Agriculture is however the principal source of livelihood for more than 70 per cent of the households. Agriculture is also a subsidiary occupation for a high proportion of non-agricultural households. The numbers of households engaged in different types of occupations whether main or subsidiary may be seen in the following table No. 2.29.

The relative importance of these occupations or means of livelihood in the economy of the rural areas may be also judged by taking into account their relative shares in the aggregate income of the rural areas. For this purpose the information collected in our Census Survey regarding incomes received by the households in S_1 , S_2 and S_3 , from all farm and non-farm activities, is analysed, and the distribution of the aggregate income according to means of livelihood (sources of income) is given in Census Table No. 17.

It may be seen from the summary of the data given in the in the table 2.30 below that primary production provides 76.6 of the total income in S_1 , 79.8% in S_2 and 80.2% in S_3 . Processing and manufacture, which includes mostly cottage industry, provides 9.71% of the total income in S_1 , as compared with 5.79% in S_2 and 7.21% in S_3 . Next in order of importance are other services in all the three strata (i.e. barbers, washermen, teachers, etc.) which contribute 6 to 7% of the total income.

Table No. 2.29.

Numbers of households engaged in different types of occupations.
(Based on Census classes)

	S ₁	S ₂	S ₃
Total No. of households	4,653	3,123	3,883
<u>No. of households having the following occupations.</u>			
<u>I. Primary Production</u>			
1. Cultivation	2,701	2,107	2,195
2. Agricultural labour	2,428	1,561	2,136
3. Rent receivers	610	132	609
4. Annual (farm) Servants	331	468	429
<u>II. Other Primary Production</u>			
5. Rearing of sheep	124	152	92
6. Rearing of Pigs	71	18	20
7. Rearing of poultry	107	33	1
8. Dairying	1,338	951	354
<u>III. Processing and manufacture</u>			
9. Tobacco factory workers and graders	672	37	--
10. Cobblers	182	170	132
11. Tailors	85	40	46
12. Weavers	92	75	114
13. Carpenters	53	39	53
14. Potters	31	55	44
<u>IV. Commerce</u>			
15. Retail Traders	207	196	194
<u>V. Transport</u>			
16. Cart drivers	71	4	--
<u>VI. Other services</u>			
17. Barbers	49	36	42
18. Washermen	175	101	128
19. Teachers	54	47	37

Table No. 2.30

Incomes of households engaged in the various census classes of occupations

	S ₁		S ₂		S ₃	
	Income Rs.	Percentage of total income	Income Rs.	Percentage of total income	Income Rs.	Percentage of total income.
I. Primary production	18,40,398	70.96	12,13,915	74.00	13,77,514	76.16
II. Other Primary production	1,46,642	5.65	95,604	5.83	72,641	4.02
III. Processing and manufacture	2,37,951	9.17	94,953	5.79	1,30,362	7.21
IV. Commerce	1,27,435	4.91	91,875	5.60	84,591	4.68
V. Transport and commu- nications	31,346	1.21	12,842	0.17	7,974	0.44
VI. Construction	11,800	0.45	4,978	0.30	6,724	0.37
VII. Public Services	13,416	0.52	19,314	1.18	16,817	0.93
VIII. Other services	1,84,572	7.12	1,16,860	7.13	1,11,972	6.19
Total	25,93,560	100.00	16,40,341	100.00	18,08,595	100.00

2.24. Incomes of cultivator and non-cultivator households.

Information collected in our Census Survey regarding the net incomes of cultivator and non-cultivator households from land and other sources indicates the poverty of the region as a whole as well as the disparity among the three strata. In S₁ villages the net income of the cultivator households from land comes to Rs.405.7 per household as compared with Rs.373.4 in S₂ and Rs.317.5 in S₃. The net income per acre of operational holding comes to Rs.59.8, 43.1 and 32.3 in S₁, S₂ and S₃ respectively. The net income from sources other than land for the same cultivator households comes to Rs.236.8 in S₁ as compared with 206.1 in S₂ and Rs.205.1 in S₃. In the case of the non-cultivator households the net income from sources other than land comes to Rs.384.6 in S₁ as compared with Rs.57.0 received from land. In S₂ villages it comes to Rs.361.4 and income from land comes to Rs.51.4. In S₃ villages it amounts to Rs.350.3 while income from land is Rs.41.6. The per capita income of cultivator households comes to Rs.128.5, Rs.107.7 and Rs.97.4 in the 3 strata respectively. While the per capita income of non-cultivator households comes to Rs.111.7, Rs.104.2 and Rs.93.9 respectively.

Table No. 2.31.
Incomes during 1958-59 in Rupees.

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
<u>Cultivators</u>			
<u>Income from land</u>			
Per acre of operational holding	59.75	43.05	32.32
Per household	405.73	373.37	317.49
<u>Income from other sources</u>			
per household	236.84	206.11	205.11
<u>Total income per household</u>			
,, per head	128.5	107.7	97.4
<u>Non-cultivators</u>			
Income from land per household	57.0	51.35	45.6
Income from other sources per household	384.6	361.4	350.3
Total per household	441.6	412.8	391.9
,, per head	111.7	104.2	93.9
<u>All households</u>			
Total income per household	558.3	525.3	465.8
,, per head	122.4	105.7	96.1

2.25. Summary.

The general backwardness of the rural economy of the project area and the poverty of the people are clearly brought out by selected economic indicators relating to land holdings, crop yields, incomes etc. The greater degree of backwardness and poverty of the Telengana part of the area is also similarly indicated. The significant details are summarised in the following table:

Table No. 2.32Economic Indicators

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
Annual average rate of growth of population	1.20	0.69	0.51
Density per sq.mile	418	301	248
Average size of household	4.56	4.88	4.85
Average size of cultivator household	5.00	5.32	5.37
Percentage of households with agricultural occupation, to total households	71.8	75.9	80.7
Percentage of non-cultivator households with agricultural occupations to total non-cultivator households	58.9	59.4	71.6
Households not having main or subsidiary agricultural occupations as % of total households	9.8	7.3	6.1
No. of workers per household	2.49	2.72	2.80
No. of workers per cultivator household	2.07	2.72	2.60
No. of workers per non-cultivator household	2.10	2.06	2.20
<u>Percentage in total workers</u>			
a) Children	2.6	4.0	4.3
b) Female (Adults)	40.1	39.5	38.1
c) Males (adults)	57.4	56.4	57.7
Size of owner holding (acres)	6.46	8.97	9.70
Value of land per holding Rs.	8,353	5,644	5,552
Value of land per acre Rs.	1,240	638	558
Size of operational holding	6.81	8.84	9.94
Percentage of leased in land	14.1	8.5	7.5
Fragmentation (No. of fragments per acre)	0.46	0.51	0.29
Work cattle per cultivator household	0.81	1.07	1.69
Milch cattle -do-	1.34	1.41	2.10
Sheep & goats -do-	0.97	2.08	1.63
Leading crops percentage of cropped area	Jowar 29.1	Jowar 27.4	Jowar 43.4
	Variga 22.0	Variga 24.4	Variga 18.7
		Bajra 20.8	pulses 18.7
	V.to-bacco 11.2	G'nut 6.5	G'nut 15.6

	S ₁	S ₂	S ₃
Area under Commercial crops %	32.11	15.29	18.99
Area under cereals etc. %	67.89	84.71	81.01
Percentage of area under mixed crops	18.85	45.96	33.97
Employment of an adult male worker in 8 hr. days	219.8	226.5	230.6
Employment in agriculture (in 8 hr. days)	166.8	168.5	189.2
Employment of a pair of work animals in 8 hr. days	115.5	102.4	79.5
Employed in crop production in 8 hr. days	72.0	73.8	66.1
Cultivator households expenditure on land improvement per acre during 1954-55 to 1958-59 in Rs.	2.65	0.94	2.22
<u>Income of cultivator households from land</u>			
i) Per operational holding	405.7	373.4	317.5
ii) Per acre of operational holding	59.8	43.1	32.3
iii) Per capita total income of cultivator households	128.5	107.7	97.4
iv) Per capita total income of non-cultivator households	111.7	104.2	93.9

APPENDIX I.
(CHAPTER II.)

Population of villages included in the frame (1951 Census)

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
<u>Guntur District :</u>			
Palnad Taluk	80,925	39,156	—
Sattenapalli	1,28,271	72,946	—
Narasaraopet	1,12,599	1,08,838	—
Guntur	56,665	10,525	—
•ngole	80,609	1,38,246	—
Vinukonda	6,212	80,800	—
Bapatla	32,953	2,826	—
<u>Nellore District</u>			
Darsi	—	90,935	—
<u>Kurnool District</u>			
Markapur	—	15,241	—
	-----	-----	-----
	4,98,234	5,59,513	—
<u>Nalgonda District</u>			
Miryalaguda	—	—	59,909
Hazurnagar	—	—	1,14,382
Suryapet	—	—	2,097
<u>Khammam District</u>			
Khammam	—	—	74,396
<u>Krishna District</u>			
Nandigama	—	—	47,989
Jaggayyapeta	—	—	32,317

			3,31,090

APPENDIX II. (Chapter II)

Cultivated Area in Villages included in the Frame
according 1951 Census(in acres)

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
<u>Guntur District</u>			
1. Palnad	1,43,799.55	63,012.50	--
2. Sattenapalli	1,53,210.00	91,839.00	--
3. Narasaraopet	1,21,079.00	1,46,148.05	--
4. Guntur	53,828.84	10,086.45	--
5. Ongole	80,758.90	1,57,219.93	--
6. Vinukonda	13,437.31	1,28,512.45	--
7. Bapatla	39,334.49	1,946.59	--
<u>Nellore District</u>			
8. Darsi	--	1,24,558.15	--
<u>Kurnool District</u>			
	--	21,381.98	--
	-----	-----	-----
	6,05,448.09	7,44,705.00	--
	-----	-----	-----
<u>Nalgonda District</u>			
Miryalaguda	--	--	2,21,198.00
Huzurnagar	--	--	3,34,018.00
Suryapet	--	--	4,837.00
<u>Khammam District</u>			
Khammam	--	--	1,32,050.00
<u>Krishna District</u>			
Nandigama	--	--	61,470.87
Jaggayyapet	--	--	38,944.02

			7,92,517.89

CHAPTER III

SURVEY OF TRADE IN AGRICULTURAL PRODUCE AND PROCESSING
INDUSTRIES IN SELECTED URBAN AREAS

3.1 General.

A survey of trade in agricultural produce and processing industries in the important urban areas situated on the Right Bank Canal side and Left Bank Canal side of the Project is taken up as a part of the Project survey with the main purpose of assessing the existing facilities for trade and processing of agricultural produce in the region. Ten centres situated on the Right Bank Canal side are selected for study and one out of these ten, is the city of Guntur which is situated not within the ayacut area but very close to it. On the Left Bank Canal side, four centres are selected and two of them, Suryapet and Khammam, are again close to but not within the ayacut area. These centres which are lying on the fringe of the Project area are nevertheless important marketing centres serving the villages of the ayacut. Information has been collected in all these areas for the year 1959-60 from traders and millers regarding various types of agricultural produce marketed, sale and purchase prices, fixed capital and working capital employed by traders and millers, etc. On the Right Bank Canal side, information is collected from 83 wholesale traders out of 198 enumerated. Similarly information is collected from 52 millers out of 75 enumerated who are distributed as follows:- 13-groundnut oil millers of whom 4 are also engaged in cotton ginning 20 castor oil crushers, ~~and~~ ^{8 tobacco reconditioning factories, 1 jute mill and 1 textile mill} 9 rice millers. On the Left Canal side, 31 traders out of 80 and 15 millers out of 16 enumerated are studied. The distribution of millers is as follows; 14 groundnut oil millers out of whom 11 are also engaged in rice milling and 3 in cotton ginning, and only one is engaged in castor oil crushing. Altogether a total number of 135 traders and millers are investigated on the Right Bank

Canal side and 46 are investigated on the Left Bank Canal side. The information collected is tabulated and presented in the tables given at the end of the chapter.

3.2 Trade in raw and processed agricultural produce.

On the Right Canal side there are regulated markets in all selected urban areas except at one place, namely, Kurichedu. These markets are regulated only in the case of commercial crops (groundnut and chillies) predominantly grown in the area at present. The licenced traders in the regulated markets receive several facilities for storage, and purchase and sale of produce. On the Left Bank Canal side there are regulated markets in all the selected centres except at Miriyalaguda and these markets cover all the important crops grown in the area. It appears from our survey that about 70% of the arrivals of produce at the market centres is brought by the producers directly. Middlemen and petty dealers play an important part in the collection of produce from small cultivators who cannot take their produce themselves to the market centres either for want of transport facilities or on account of the smallness of the quantity of the produce or because they are obliged to sell their produce to the dealers. At the market centres there are various types of agencies engaged in the purchase and sale of agricultural produce such as commission agents, wholesale dealers and millers. It may be seen from tables No. 3.2 and 3.3 appended, giving details of market arrivals for ten agricultural commodities and their purchase and sale prices, for the year 1959-60, that groundnut, chillies, coriander, pulses and cotton are the most important commodities dealt with on the Right Bank Canal side. The trade in paddy on the Right Canal side is found to be confined exclusively to the Guntur City, but paddy is not an important commodity produced in the ayacut villages at present. On the Left

Bank Canal side also groundnut is the most important commodity dealt with in the markets. Next to groundnut the important commodities are paddy, ^wgrass-pulses, and jowar. The total values of market arrivals of selected commodities at the centres on the Right and Left Bank Canal sides are as follows:

Market Arrivals for 1959-60

(in thousands of Rs.)		
Commodity	Right Canal side	Left Canal side
1. Paddy	10080	10171
2. Jowar	652	474
3. Redgram	2010	1052
4. Greengram	947	568
5. Coriander	5662	-
6. Groundnut	14916	20683
7. Castor	1286	219
8. Chillies	10629	177
9. Cotton	3138	320
10. Sunhemp	419	48
Total	49740	33711

As already pointed out, groundnut is a most important common crop on both sides of the Project area.

It is found that the quantity of arrivals of groundnut at the marketed centres are generally in excess of the produce of the ayacut. This may be explained by the fact that the region imports considerable quantities of groundnut ^{from} ~~from~~ delta taluks of Tenali, Bapatla and Repalle where groundnut is grown as a rabi crop and also from areas outside the ayacut on the Left Bank Canal side. The quantities received at the various markets from within ^{and} ~~the~~ outside the region are almost wholly consumed by the oil mills of the region. About 2/5 of oil

production is exported to Orissa and Bengal and the remaining is consumed in Andhra. Groundnut oil cake which is mostly used as manure is consumed in adjoining delta areas, ^{chilly crop} is mainly raised on the Right Bank Canal side and chillies are exported from this region to Madras, Mysore and Kerala. Exports to these areas constitute nearly 75% of the total exports from this region. There is also considerable export of chillies to Bengal and East Pakistan.. Cotton crop is also raised mostly on the Right Bank Canal side and is consumed mostly by the local ginning mill and only ginned cotton is exported. As there are no spinning or weaving mills located in the region, the entire output of ginned cotton is exported to places outside the region. Cotton seed which is used as fodder for cattle finds good market in delta districts of Andhra Pradesh. The surplus produce of grams and pulses is exported to delta areas in Andhra and Madras. The surplus produce of coriander is exported to Madras and Mysore and paddy which is an important crop on the Left Bank Canal side is exported to areas mainly outside the Andhra State. Virginia tobacco, which is raised mostly in Guntur, Narasaraopeta and Sattenapalli taluk, on the Right Canal side, is processed in the redrying factories of the region and exported directly to foreign countries like United Kingdom, Holland, and Germany. Tobacco seed ^{oil} ~~or~~ which some groundnut oil mills are ^{processing} ~~producing~~ is exported to Hyderabad, Mysore and Bengal. Castor oil finds an export market in the district and in Madras.

3.3 Capital employed and turn over of traders.

Details of fixed capital and working capital and the turnover in goods per trader are given in table No. 3.4 for both sides of the Project area. It is found that on average, a trader has invested in his business Rs. 26,000 as

fixed capital, and his working capital amounts to Rs.61,500 out of which an amount of Rs. 25,400 is borrowed. The value of purchases per trader has come to Rs. 4.55 lakhs; and the amount of working capital employed in business has come to 13.52% of the value of purchases. On the Left Bank Canal side, the total fixed capital per trader has come to Rs.4,000 only, which is considerably less than the amount on the Right Canal side. The total working capital per trader amounts to Rs.39,700, constituting 26.2% of the value of purchases. As indicated in table No. 12, on the Right Bank Canal side 58.75% of the working capital employed in trade is provided by the trader himself, while 23.86% is borrowed from money lenders and 17.4% from banks. On the Left Bank Canal side 49.84% of the working capital is provided by the trader himself, 17.42% is borrowed from money-lenders and 33.1% from banks.

3.4 Processing industries.

The main processing industries of the ayacut area on the Right Canal side are groundnut oil mills, castor oil crushers, and cotton ginning mills, and there are no rice mills at any centre except at Guntur. The main industries on the Left Bank Canal side are rice mills, groundnut oil mills and castor oil crushers. In several cases, the same mills undertake two or three types of processing.

From the information we are able to gather about the fixed capital and working capital employed in these mills and their production, it appears that on the Right Bank Canal side, on average the amount of fixed capital employed in groundnut oil mills comes to Rs. 1.11 lakhs and the amount of working capital to Rs. 1.93 lakhs, out of which Rs. 1.17 lakhs is borrowed amount. The average output per mills is 1703 candies of groundnut oil, and 6.9 bags of oil cake (one bag = 160 lbs.), the value of output of oil and cake together amounting to Rs. 6.50 lakhs. On the Left Bank Canal side, the amount of fixed capital per groundnut oil

mill is Rs. 1.11 lakhs which is the same as on the Right Canal side. The amount of working capital comes to Rs. 2.73 lakhs out of which Rs. 1.7 lakhs is borrowed. The average output per mill is 1791 candies of oil and 6.1 bags of oil cake, the value of output of oil and cake together amounting to Rs. 7.17 lakhs.

Information collected about 9 rice mills situated in Guntur shows that the amount of fixed capital is Rs.84.70 thousands per mill and the amount of working capital is Rs. 1.57 lakhs, out of which Rs. 27.2 thousand is borrowed. The average quantity of rice sold per mill comes to 31,000 bags valued at Rs. 12.71 lakhs.

As regards castor oil crushers, the information collected about 20 castor oil crushers on the Right Bank Canal side shows that the amount of fixed capital per mill amounts Rs. 17.1 thousand, and working capital to Rs. 22.4 thousand, out of which an amount of Rs. 7.7 thousands is borrowed. The output per mill is 205.4 candies of castor oil and 806 bags of cake, the total value of output being Rs. 80.9 thousand. Information collected about cotton gins shows that the output of cotton per mill is 232 candies (candy = 784 lbs.) and 959 candies of seed (a candy = 500 lbs.), the value of output of cotton and seed being Rs. 2.40 lakhs. As regards the sources of working capital employed by mills it is found that on the Right Canal side 32.5% is borrowed from banks, 8.6% is borrowed from money-lenders and the remaining is provided by the owners themselves. On the Left Canal side, however, borrowed finance is comparatively higher, 45.7% being taken from banks and 14.7% from money lenders and the balance of 39.6% from owned resources.

Tobacco redrying factories on the Right Bank Canal side are situated in Guntur and Chilakaluripeta and these constitute a most profitable processing enterprise in the Guntur district. Most of them process Virginia tobacco and

a few of them also trade in country tobacco. Information collected from 8 factories shows that the total purchases of virginia tobacco per factory amount to 30 lakhs lbs. valued at Rs. 20 lakhs. The value of exports per factory amount to Rs. 24.7 lakhs. The tobacco purchasing depots and redrying factories provide seasonal employment for ten to fifteen thousand labourers every year.

There is one jute mill situated in Guntur town which is the only one for the Project region. It manufactures twine and cement bags and the Ongole taluk of the project area contributes about 20% of the raw jute purchased by the jute mill, the remainder of the raw jute required is imported from Vizianagaram in north Andhra and Cuttack in Orissa. The mill employs about 1400 labourers. Jute twine produced by the mill is mostly consumed in the region itself. The output of cement bags is exported to cement companies.

There is also one cotton yarn mill at a little distance from the town of Guntur, with a fixed capital of Rs. 28.8 lakhs and borrowed working capital amounting to Rs. 52,000. The mill employs 730 workers, and it buys a good proportion of its requirement of raw cotton from the project area on the Right Canal side. The output of the factory for the year 1959-60 is reported as 32.67 lakhs of lbs. of yarn of counts (20s-36s) valued at Rs. 55.39 lakhs. The output is consumed entirely within the State by the handloom industry.

SURVEY OF TRADE IN AGRICULTURAL PRODUCE AND PROCESSING INDUSTRY IN SELECTED URBAN AREAS

Table No. 3.1

LOCATION OF SELECTED URBAN AREAS AND DETAILS OF SCHEDULES FILLED

S.No.	Name of the Centre	Location	Traders		Mills (Processing concerns)		Total Schedules filled	Remarks
			Total No.	Studied	Total No.	Studied		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>Right Canal side</u>								
1.	Chilakaluripet	Stratum 1	6	3	2+3*	1	4	* Tobacco Redrying factories ⊛ Excluding Tobacco Dealers who are about 150 @ 18 Tobacco Redrying factories + 1 Jute Mill + 1 Textiles, out of which 8 Tobacco factories and one jute mill are studies
2.	Piduguralla	Stratum 1	7	2	6	6	8	
3.	Rentachintala	Stratum 1	5	5	-	-	5	
4.	Addanki	Stratum 1	8	2	1	1	3	
5.	Sattenapalli	Stratum 2	4	-	6	6	6	
6.	Narasaraopet	Stratum 2	16	16	14	12	28	
7.	Vinukonda	Stratum 2	10	10	4	2	12	
8.	Ongole	Stratum 2	20	8	3	2	10	
9.	Kurichedu	Stratum 2	7	7	-	-	7	
10.	Guntur		115⊛	30	14+20@	13+9	52	
Total			198	83	50+23	43+9	135	
<u>Left Canal Side</u>								
1.	Miriyalguda	Stratum 3	30	20	1	1	21	
2.	Jaggayyapet	Stratum 3	20	6	5	4	10	
3.	Suryapet		15	2	5	5	7	
4.	Khammam		15	3	5	5	8	
Total			80	31	16	15	46	

Table No. 3.2

MARKET ARRIVALS AT SELECTED URBAN AREAS DURING 1959-'60

(figures are in hundreds of bags except for cotton)

Market Centre	Paddy	Jowar	Redgram	Greengram	Coriander	Groundnut	Castor	Chil- lies (Candies)	Cotton (Candies)	Sunhemp
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<u>Right Canal side:</u>										
1. Chilakaluripet	-	25	-	-	-	131	-	80	-	-
2. Piduguralla	-	-	10	2	-	926	50	-	36	-
3. Rentachintala	-	-	10	-	20	120	6	950	49	-
4. Addanki	-	6	6	-	5	62	-	-	-	-
5. Sattenapalli	-	-	-	-	-	515	30	44	19	-
6. Narasaraopet	-	50	96	40	2	3818	150	26	33	9
7. Vinukonda	-	-	42	5	5	-	25	-	43	50
8. Ongole	-	100	100	80	15	141	-	40	-	-
9. Kurichedu	-	-	100	5	-	-	10	-	24	5
10. Guntur	4200	-	165	75	1150	1660	10	3420	-	-
Total	4200	181	530	207	1197	7573	281	4560	204	64
<u>Left Canal side:</u>										
1. Miriyalaguda	1000	40	33	50	-	750	30	3	-	3
2. Jaggayyapet	200	20	80	60	-	1500	-	15	20	-
3. Suryapet	1150	25	36	10	-	2556	18	20	-	-
4. Khammam	1300	50	96	10	-	4540	2	45	-	5
Total	3650	135	242	130	-	9346	50	83	20	8

N.B.:— The information about market arrivals is gathered from enquiries at the regulated market yards, merchants' associations and cooperative marketing societies, besides traders and millers at each centre.

SURVEY OF TRADE IN AGRICULTURAL PRODUCE AND PROCESSING INDUSTRY IN SELECTED URBAN AREAS

Table No. 3.3

WHOLE SALE AVERAGE PRICES (PURCHASES & SALES) DURING 1959-'60

(Units are in bags except for cotton for which unit is a candy)

Market Centre	Paddy		Jowar		Bajra		Greengram		Red gram		Groundnut	
	Purcha- ses	Sales	Purcha- ses	Sales	Purcha- ses	Sales	Purcha- ses	Sales	Purchases	Sales	Purchases	Sales
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
<u>Right Canal Side</u>												
1. Chilakaluri- pet	-	-	39.00	41.00	-	-	-	-	-	-	19.09	-
2. Piduguralla	-	-	-	-	-	-	31.95	40.82	23.41	38.78	22.50	-
3. Rentachintala	-	-	-	-	-	-	-	-	66.01	39.60	-	-
4. Addanki	-	-	36.00	41.60	40.00	42.50	-	-	-	-	20.00	-
5. Sattenapalli	-	-	-	-	-	-	-	-	-	-	20.73	-
6. Narasaraopet	-	-	26.07	37.36	28.60	34.60	40.91	49.04	38.83	39.57	22.76	-
7. Vinikonda	-	-	32.85	34.80	34.35	39.13	51.76	50.27	30.42	44.41	-	-
8. Ongole	-	-	36.11	42.22	38.38	43.18	42.00	45.00	40.12	44.54	19.62	-
9. Kurichedu	-	-	32.00	34.00	36.02	39.79	48.39	50.30	40.80	42.43	-	-
10. Guntur	24.00	N.A	36.61	N.A	39.00	N.A	48.87	46.04	36.54	38.29	19.00	-
Overall	24.00	-	36.03	40.61	33.19	42.83	45.76	46.46	37.93	42.32	20.23	-
<u>Left Canal Side</u>												
1. Miriyalguda	26.65	26.34	32.58	34.51	33.12	36.07	41.87	45.15	47.62	49.65	21.16	22.87
2. Jaggayapet	23.78	27.51	40.17	36.28	32.63	38.39	42.66	43.73	46.34	45.48	22.05	22.27
3. Suryapet	27.59	29.51	31.94	36.72	-	-	44.09	44.41	38.77	37.16	23.44	23.43
4. Khammam	28.31	28.88	38.03	N.A	-	-	44.16	42.76	40.93	41.60	22.46	N.A
Overall	27.79	28.55	35.08	35.17	32.99	36.69	43.72	43.17	43.48	44.60	22.13	22.82

SURVEY OF TRADE IN AGRICULTURAL PRODUCTS AND PROCESSING INDUSTRY IN SELECTED URBAN AREAS

Table No. 3.3 (Contd.)

WHOLE SALE AVERAGE PRICES (PURCHASES & SALES) DURING 1959-'60

(Units are in bags except for cotton for which unit is a candy)

	Castor		Chillies		Cotton		Coriander		Sunhemp		Gingelly	
	Purcha- ses (14)	Sales (15)	Purcha- ses (16)	Sales (17)	Purcha- ses (18)	Sales (19)	Purchases (20)	Sales (21)	Purcha- ses (22)	Sales (23)	Purcha- ses (24)	Sales (25)
<u>Right Canal Side</u>												
1. Chilakaluripet	-	-	18.32	25.00	-	-	-	-	-	-	-	-
2. Piduguralla	54.83	N.A.	-	-	-	-	-	-	30.63	62.46	-	-
3. Rentachintala	45.40	49.20	21.01	21.01	153.87	658.27	45.33	50.00	-	-	-	-
4. Addanki	-	-	-	-	-	-	40.00	42.60	-	-	-	-
5. Sattenapalli	-	-	-	-	-	-	-	-	-	-	-	-
6. Narasaraopet	48.03	49.40	22.18	23.26	160.19	684.11	42.56	35.50	66.74	67.23	62.37	66.01
7. Vinukonda	46.05	47.11	22.23	25.27	208.47	692.94	44.99	46.20	66.07	68.79	69.27	72.33
8. Ongole	-	-	23.00	25.00	-	-	41.90	44.28	-	-	-	-
9. Kurichedu	44.12	45.74	-	-	153.64	523.73	-	-	62.09	69.84	67.03	68.96
10. Guntur	-	-	32.74	40.12	-	-	48.04	40.00	-	-	-	-
Overall	45.78	46.93	23.81	22.95	153.80	594.48	47.30	46.50	65.52	68.73	68.53	71.32
<u>Left Canal side</u>												
1. Miriyalguda	43.66	45.12	-	-	160.00	N.A.	-	-	52.14	63.08	63.08	70.63
2. Jaggayyapet	46.88	N.A.	20.95	22.55	-	-	-	-	60.05	60.08	-	-
3. Suryapet	44.11	50.33	-	-	-	-	-	-	67.17	63.59	59.00	58.50
4. Khammam	51.00	N.A.	22.87	N.A.	-	-	-	-	63.96	64.27	-	-
Overall	43.73	45.13	21.29	22.55	160.00	-	-	-	59.69	63.76	62.39	69.48

SURVEY OF INVESTMENT IN AGRICULTURAL PRODUCE AND PROCESSING INDUSTRIES IN SELECTED URBAN AREAS

Table No. 3.4

FIXED CAPITAL, WORKING CAPITAL AND VALUE OF PURCHASES & SALES PER TRADER 1959-60

S.No.	Centre	Fixed Capital at the end of the year (in Rs)	Working capital during the year		Total working capital (Rs)	Percentage of working capital in total purchases	Total value of (in Rs)	
			Own Rs	Borrowed Rs			Purchases	Sales
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<u>Right Canal Side</u>								
1.	Chilakaluripet	113	20,000	3,666	23,666	34.80	82,378	34,680
2.	Piduguralla	600	6,500	3,500	13,000	34.23	37,979	36,087
3.	Rentachintala	11,600	46,200	21,200	67,400	7.74	8,71,196	8,72,480
4.	Addanki	103	9,000	6,500	15,500	59.16	26,200	26,225
5.	Sattenapalli	-	-	-	-	-	-	-
6.	Narasaraopet	70,275	20,625	61,925	82,550	15.16	5,44,460	6,26,704
7.	Vinukonda	16,410	13,450	14,170	27,620	13.33	2,07,133	2,15,564
8.	Ongole	3,200	38,625	13,250	51,875	6.64	7,81,643	8,19,357
9.	Kurichedu	3,814	38,571	7,857	46,428	21.92	2,11,843	2,25,465
10.	Guntur	3,725	59,750	2,000	61,750	11.22	5,50,158	5,76,752
Overall		26,034	36,130	25,363	61,493	13.52	4,54,957	4,87,139
<u>Left Canal Side</u>								
1.	Miriyalguda	5,488	11,955	7,595	19,550	25.53	76,576	76,251
2.	Jaggayyapeta	1,166	27,500	31,666	59,166	20.86	2,83,553	2,25,186
3.	Suryapet	2,000	12,500	12,500	25,000	14.12	1,77,079	1,92,700
4.	Khammam	2,636	60,000	85,000	1,45,000	37.63	3,85,294	3,51,213
Overall		3,925	19,648	20,061	39,709	28.26	1,40,484	1,28,924

SURVEY OF TRADE IN AGRICULTURAL PRODUCE AND PROCESSING INDUSTRY IN SELECTED URBAN AREAS

Table No. 3.5

GROUNDNUT OIL MILLS (DETAILS PER MILL) 1959-60.

Name of the Centre	No. of mills studied	Fixed capital in thousands of Rs.	Working Capital in thousands of Rs.			Purchase price per bag of Groundnut	Purchases in bags	Sale price per candy of oil	Sale price for bag of cake.	Average Output	
			Own	Borrowed	Total					Oil in candies	Cake in bags.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>Right Canal Side</u>											
1. Chilafaluri-pet.	1	75.00	250.00	--	250.00	19.09	12,559	379.45	24.84	640.065	2,497
2. Piduguralla	3	Not Available	45.67	253.00	298.67	22.50	25,103	365.94	24.28	1547.297	5,412
3. Rentachintala	--	--	--	--	--	--	--	--	--	--	--
4. Addanki	1	102.00	50.00	75.00	125.00	20.00	2,600	390.00	25.00	125.000	1,600
5. Sattenajalli	2	30.00	30.00	50.00	80.00	20.73	18,661	373.40	19.09	987.407	5,290
6. Narasaraopet	2	40.00	35.00	37.50	72.50	22.76	31,948	405.43	26.84	1746.090	5,370
7. Vinukonda	--	--	--	--	--	--	--	--	--	--	--
8. Ongole	2	54.75	27.50	57.50	85.00	19.62	9,400	478.94	25.25	379.315	2,475
9. Kurichedu	--	--	--	--	--	--	--	--	--	--	--
10. Guntur	2	299.42	200.00	150.00	350.00	19.00	1,32,117	374.99	21.49	5253.334	21,847
Overall	13	110.59	76.30	117.10	193.41	20.23	36,517	381.50	22.71	1703.192	6,946
<u>Left Canal Side</u>											
1. Miriyelaguda	1	200.00	150.00	80.00	230.00	25.10	18,364	408.16	26.20	278.050	1,087
2. Jaggayvapeta	4	80.00	86.00	184.00	270.00	23.14	20,553	488.56	25.38	1105.005	3,586
3. Suryapet	4	112.50	87.50	35.00	122.50	24.99	43,624	386.27	25.42	1183.242	4,174
4. Khammam	5	124.00	110.00	284.00	394.00	23.40	58,720	376.89	25.00	3008.260	10,290
Overall	14	111.33	101.88	170.67	272.55	23.91	37,974	399.82	25.15	1791.315	6,108

SURVEY OF TRADE IN AGRICULTURAL PRODUCE AND PROCESSING INDUSTRY IN SELECTED URBAN AREAS

Table No. 3.6

Castor Oil Crushers (Details per Crusher) 1959-60

Name of the Centre	No. of Crushers Studied	Fixed Capital in Thousands of Rs.	Working Capital in thousands Rs.			Purchase price per xxxxx bag.	Purchases in bags	Sale Price per candy of oil	Sale price per bag of cake	Output	
			Own	Borrowed	Total					Oil in candies	Cake in bags.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>Righe Canal Side</u>											
1. Chilakuluripet	-	--	--	--	--	--	--	--	--	--	--
2. Pidiguralla	3	10.00	18.67	8.00	26.67	46.06	1,670	297.36	22.03	231.334	780
3. Rentachintala	-	--	--	--	--	--	--	--	--	--	--
4. Addanki	-	--	--	--	--	--	--	--	--	--	--
5. Sattanapalli	4	7.67	8.75	5.25	14.00	38.48	780	288.97	26.01	90.181	354
6. Narsaraopet	10	22.72	15.29	11.32	26.61	48.12	1,758	318.46	22.66	233.340	880
7. Vinukonda	2	22.55	17.50	5.00	22.50	46.45	2,351	298.02	23.07	276.313	1,338
8. Ongole	-	--	--	--	--	--	--	--	--	--	--
9. Kurechedu	-	--	--	--	--	--	--	--	--	--	--
10. Guntur	1	--	N.A.	N.A.	N.A.	47.31	1,114	278.00	24.50	170.120	882
Overall	20	17.12	14.68	7.75	22.43	46.56	1,579	307.56	22.47	205.425	806
<u>Left Canal Side</u>											
1. Miriyalguda	-	--	--	--	--	--	--	--	--	--	--
2. Jaggayyapeta	-	--	--	--	--	--	--	--	--	--	--
3. Suryapet	1	3.00	6.00	--	6.00	45.15	680	318.51	30.00	85.300	269
4. Khammam	-	--	--	--	--	--	--	--	--	--	--
Overall	1	3.00	6.00	--	6.00	45.15	680	318.51	30.00	85.300	269

N.A. = Not Available.

SURVEY OF TRADE IN AGRICULTURAL PRODUCE AND PROCESSING INDUSTRIES IN SELECTED CANAL AREAS

Table No. 3.7

PADDY MILLS (DETAILS (PER MILL) 1959-60
(1 Bag = 200 lbs.)

Centre	No. of Mills studied	Fixed Capital Rs.	Working Capital (Rs.)			Purchase Price per bag of Paddy	Total purchases of paddy in bags	Sales price of bag of rice	Total sales in rice (Bags)
			Own	Borrowed	Total				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Right Canal Side</u>									
1. Chilakaluripet	-	-	-	-	-	-	-	-	-
2. Piduguralla	-	-	-	-	-	-	-	-	-
3. Rentachintala	-	-	-	-	-	-	-	-	-
4. Addanki	-	-	-	-	-	-	-	-	-
5. Sattenapalli	-	-	-	-	-	-	-	-	-
6. Narasaraopet	-	-	-	-	-	-	-	-	-
7. Viratikonda	-	-	-	-	-	-	-	-	-
8. Ongole	-	-	-	-	-	-	-	-	-
9. Kurichedu	-	-	-	-	-	-	-	-	-
10. Guntur	9	84,667	1,30,000	27,222	1,57,222	27.70	46,127	41.08	30,987
Overall	9	84,667	1,30,000	27,222	1,57,222	27.70	46,127	41.08	30,987
<u>Left Canal Side</u>									
1. Miriyalaguada	1	included in Groundnut oil mills				27.20	8,658	Not available	Not available
2. Jaggayyapet	1					18.27	332	65.39	9,548
3. Suryapet	4					28.65	16,115	67.23	6,780
4. Khammam	5					25.97	11,002	64.59	3,496
Overall	"					27.38	11,678	66.19	4,475

SURVEY OF TRADE IN AGRICULTURAL PRODUCE AND PROCESSING INDUSTRY IN SELECTED URBAN AREAS

Table No. 3.8

COTTON MILLS (DETAILS PER MILL) 1959-60

1 candy = 500 lbs., 1 maund = 24 lbs.

Centre	No. of Mills studied	Fixed Capital in Rs.	Working Capital		Purchase Price per maund of raw cotton	Total purchases in maunds	Sale per candy of ginned cotton of 784 lb.	Sale per candy of seed	Average Output		
			own	Borrowed					Total	Cotton candies	Seed candies
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>Right Canal Side</u>											
1. Chilakuluripet	-	Included in Groundnut Oil Mills				--	--	--	--	--	--
2. Pidugurall	3				9.02	20,541	677.93	76.58	200		851
3. Rentachintala	-				--	--	--	--	--	--	--
4. Addanki	--				--	--	--	--	--	--	--
5. Sattanapalli	1				9.08	36,475	732.18	93.15	326		1,283
6. Narasaraopet	-				--	--	--	--	--	--	--
7. Vinukonda	-				--	--	--	--	--	--	--
8. Ongole	-				--	--	--	--	--	--	--
9. Kurochedu	-				--	--	--	--	--	--	--
10. Guntur	-				--	--	--	--	--	--	--
Overall	4				9.04	24,525	697.99	82.15	232		959
<u>Left Canal Side</u>											
1. Miriyalaguda	-	Included in Groundnut Oil Mills				--	--	--	--	--	--
2. Jaggayyapet	3				9.25	10,713	752.30	143.01	95		467
3. Suryapet	-				--	--	--	--	--	--	--
4. Khammam	-				--	--	--	--	--	--	--
Overall	3				9.25	10,713	752.30	143.01	95		467

SURVEY OF TRADE IN AGRICULTURAL PRODUCE AND PROCESSING INDUSTRY

SELECTED URBAN AREAS

Table 3.9.

TOBACCO REDRYING FACTORIES (Number of factories studied
being 8) GUNTUR 1959-60.

S.No.	Item	Virginia tobacco	Country tobacco
	(1)	(2)	(3)
1.	No. of Factories purchasing	8	3
2.	Purchases made per factory at Guntur Centre	Qty. in lbs. 14,23,090 Value in Rs. 10,42,344	5,11,868 2,65,080
	Purchase price per lb. (in Rs.)	0.73	0.52
3.	Purchases made at other centres per factory	Qty. in lbs. 15,72,946 Value in Rs. 9,60,219	97,375 45,229
	Purchase price per lb. (in Rs.)	0.61	0.46
4.	Total purchases per factory	Quantity in lbs. 29,96,036 Value in Rs. 20,02,563	6,09,243 3,10,309
	Purchase price per lb. (in Rs.)	0.67	0.51
5.	Percentage of purchases made at Guntur in the total purchases	47.50	84.02
6.	Exports per factory	Qty. in lbs. 19,80,428 Value in Rs. 24,65,062	1,71,255 2,47,339
	Export price per lb. (in Rs.)	1.24	1.45
7.	Percentage of Exports in total purchases	66.10	28.11
8.	Local sales per factory	Qty. in lbs. 2,20,317 Value in Rs. 1,32,404	Not Available Not Available

SURVEY OF TRADE IN AGRICULTURAL PRODUCE AND PROCESSING INDUSTRY

SELECTED URBAN AREAS

Table 3.10

PERCENTAGE DISTRIBUTION OF WORKING CAPITAL OF TRADERS AND MILLERS

ACCORDING TO SOURCE 1959-'60

S.No.	Centre	Traders			Millers		
		Own	Money lender	Banks	Own	Money lender	Banks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<u>Right Canal Side</u>							
1.	Chilakaluri-pet.	69.77	30.23	--	100.00	--	--
2.	Piduguralla	50.00	50.00	--	24.64	31.15	44.21
3.	Rentachintala	68.55	31.45	--	--	--	--
4.	Addanki	58.06	41.94	--	40.00	--	60.00
5.	Sattanapalli	--	--	--	44.47	6.06	49.47
6.	Narsaraopet	24.98	28.01	47.01	54.22	18.00	27.78
7.	Vinukonda	48.70	13.76	37.54	77.78	--	22.22
8.	Ongole	74.46	12.05	13.49	32.35	11.77	55.88
9.	Kurichedu	83.08	16.92	--	--	--	--
10.	Guntur	96.76	3.24	--	75.22	--	24.78
	Overall	58.75	23.86	17.39	58.89	8.63	32.48
<u>Left Canal Side</u>							
1.	Miriyalaguda	61.15	37.70	1.15	100.00	--	--
2.	Jaggayyapeta	46.48	13.24	40.28	40.90	34.65	24.45
3.	Suryapet	50.00	30.00	20.00	71.77	--	28.23
4.	Khammam	41.38	1.15	57.47	27.92	10.15	61.93
	Overall	49.48	17.42	33.10	39.64	14.65	45.71

CHAPTER III

A P P E N D I X - 1.

Customary Units and their equivalents in lbs.

Right Canal side:

Commodity	Customary Unit	Equivalent in lbs.
(1)	(2)	(3)
1. Chillies	Maund	24
2. Ginned cotton	candy	784
3. Cotton seed	candy	500
4. Cotton seed	Bag	160
4. Redgram	Bag	225
5. Betel leaves	Basket	2500 or 3000 leaves
6. Oil cake	Bag	160
7. Ghee	Tin	37
8. Sunhemp	Bag	220
9. Castor seed	Bag	175
10. Gingelly	Bag	225
11. Jowar	Bag	220
12. Coriander	Bag	95
13. Ragi	Bag	220
14. Groundnut	Bag	84

Left Canal Side:

Commodity	Customary Unit	Equivalent in Lbs.
(1)	(2)	(3)
1. Groundnut (Pod)	Bag	86
2. Groundnut (Kernel)	Bag	177
3. Groundnut (Cake)	Bag	160
4. Greengram	Bag	225
5. Redgram	Bag	225
6. Chillies	Maund	25
7. Jowar	Bag	220
8. Paddy	Bag	165
9. Paddy Husk	Bag	123
10. Sunhemp	Bag	220
11. Horse Gram	Bag	220
12. Blackgram	Bag	225
13. Black Mung	Bag	225
14. Anumulu	Bag	220

CHAPTER IV

INPUT-OUTPUT RELATIONS IN FARM BUSINESS AND IN SELECTED
FARM AND NON-FARM ENTERPRISES

4.1 General.

This chapter is devoted to a detailed study of farm business as a whole and of selected individual enterprises both farm and non-farm, existing in the rural area of the Nagarjunasagar Project. The account given here of these activities is based entirely on the study of samples of farm and of non-farm activities which we have done for the year 1959-'60. In ~~the previous~~ chapter we studied in a general way about the ~~diversity~~ ^{diversity} of cropping pattern, and the resource position of farmers, and the nature and importance of non-farm activities in the three strata of the Project area. In the present Chapter it is our object to make detailed studies of input-output ~~structures~~ ^{relationship}, cost of cultivation or production, profitability and other aspects of farm business ~~for~~ ^{and of} selected farm and non-farm activities. Generally, detailed input-output studies are undertaken to provide the best possible insight into the actual situation in respect of economic activities and to serve the ends of price and income policies in respect of such activities. In order to achieve these objects of input-output studies we may adopt one or more of three well-known approaches in the collection and analysis of data, namely, (1) the sector approach, (2) the farm (firm) approach, and (3) the product (enterprise) approach. Lack of statistical data for the region as a whole and for the individual parts of a region makes it difficult to adopt the sector approach. We have

therefore to depend on the farm and enterprise approaches only. In our study of the economic activities in the rural area of the Nagarjunasagar Project we have attempted to make use of both these approaches. We shall first take up the farm approach and study the input-output relation in farm business as a whole; and then take the product approach or enterprise approach. The latter provides information about unit-costs of products which is required for the study of absolute or relative prices of products. It ^{also} helps ~~indirectly~~ to determine incomes for farms ~~through an indirect way, as contrasted with the former approach which is a direct one.~~ ~~xxxxx approach to the problem.~~

4.2 Input-Output relation in Farm Business.

(a) Concepts of cost and income.

The success or failure of farm business is generally judged on the basis of certain measures such as (1) the net profit (or loss) taking into account both the fixed and variable costs which have to be met in the long-run, (2) farm family labour income (3) farm business income, (4) farm investment income, (5) net returns to capital and labour, and (6) input-output ratio. Total cost or input in farm business consists of both fixed and variable costs including the imputed values of rent on owned land, interest on owned capital and family labour. The total output consists of the value of all the products raised on the farm including the value of the by-products. Net profit (or loss) is obtained as the residual in the value of total output or gross produce after meeting both the variable and fixed costs or total input. The latter is a comprehensive concept of cost which is generally referred to as cost C in

farm business studies. Farm family labour income is obtained as the residual in the ~~xx~~ gross produce after all the costs excepting the imputed value of family labour are deducted. Similarly, ~~farm~~ farm business income is obtained as the residual in the value of gross produce after making allowance for all the costs except the imputed values of family labour, rent on owned land and interest on owned capital. Farm investment income is the residual in the gross produce obtained after deducting all costs except the imputed values of rent on owned land and interest on own capital. These concepts of net profit (or loss), farm family labour income, farm business income, etc., may ~~xx~~ also be computed by adopting a suitable classification of costs. Cost C as already pointed out includes all costs, both variable and fixed ~~costs~~, and is used as a basis for measuring net profit (or loss) in the long-run. In farm business studies other concepts of costs are also used for the purpose of determining the shares in the gross produce accruing to land and capital owned by the farmer or to the farm family, etc. Cost A_1 includes the cost of hired human labour, cost of materials, fuel and power used, interest on crop loans and depreciation on implements. The value of gross produce minus Cost A_1 will then become a measure of farm business income not deducting rents payable on leased-in lands. If rent paid for leased-in lands is added to Cost A_1 it becomes cost A_2 and it can be used to determine farm business income, or the net returns to owned capital and land and family labour. If the imputed value of family labour is added to Cost A_2 which may then be considered as Cost A_3 , the latter becomes a measure for determining farm investment income or net returns to

farm land and capital owned by the farmer. Cost B is arrived at by adding to cost A₂ the imputed value of rent on owned land and interest on owned capital. The value of gross produce minus cost B will then become a measure of farm family labour income. The way the various cost and income concepts are related to one another may be seen in the following tables No. 4.1 and 4.2 relating to the breakdown of total cost of cultivation and the various types of cost and income which are given separately for the 3 strata in the Nagarjunasagar Project Area.

Table No. 4.1

Breakdown of total cost in Farm Business in Rs. (per acre held)
(For Crop-Production only)

	S ₁	% in total cost	S ₂	% in total cost	S ₃	% in total cost
1. <u>Human labour</u>	38.66	20.95	29.28	24.75	36.29	28.94
<u>Materials, power and fuel</u>						
2. Bullock labour	28.22		26.12		25.62	
3. Seed	8.48		5.39		11.23	
4. Manures & fertilisers	28.04		12.10		9.17	
5. Pesticides	0.42		-		-	
6. Fuel	7.93		2.18		-	
7. Hire charges for implements	2.27		0.28		0.10	
Total of materials power & fuel	75.41	40.87	46.07	38.95	46.12	36.77
<u>Other costs</u>						
8. Depreciation	6.52		2.89		2.42	
9. Rent paid	9.77		4.23		5.54	
10. Rental value	48.54		33.14		32.22	
11. Interest on fixed capital	1.42		0.66		0.42	
12. Interest on crop loan	1.01		0.06		0.49	
13. Land revenue, cesses and other charges	3.19		1.95		1.91	
Total of other costs	70.45	38.13	42.93	36.30	43.00	34.29
Overall	184.52	100.00	118.23	100.00	125.41	100.00

Table No. 4.2

Different types of Cost and Income per acre (in Rs.)

Item (Types of cost or income)	S ₁	S ₂	S ₃
1. Total output or value of gross produce	192.8	107.6	101.0
2. Cost A ₁	107.7	63.4	63.0
3. Farm business income not deducting rents payable on leased-in lands (1)-(2)	85.1	44.2	33.0
4. Cost A ₂	116.3	67.6	73.5
5. Farm business income (1)-(4)	76.0	40.0	27.5
6. Cost A ₃	134.5	84.5	92.8
7. Farm investment income (1)-(6)	53.3	23.1	8.2
8. Cost B	166.8	101.4	106.1
9. Farm family labour income (1)-(8)	26.0	6.2	-5.1
10. Cost C	134.5	113.3	125.4
11. Net profit (or loss) (1)-(10)	8.3	-10.7	-24.4
12. Cost of material inputs including fuel & power	75.4	46.1	46.1
13. Gross value added (1)-(12)	117.4	61.5	54.9
14. Depreciation	6.5	2.8	2.4
15. Net value added (13)-(14)	110.9	58.7	52.5
16. Output-Input ratio $(1)/(10)$	1.04	0.91	0.81

(b) Breakdown of total cost in farm business

Details of the various components of total cost in farm business calculated on the basis of cost per acre held as well as cost per acre cropped, and the relative importance of the different components of cost are given in table No. 39 (Farm Surveys). The total cost per acre held in farm business, taking into account crop production only has come to Rs. 134.52 in S₁ as compared with Rs. 113.23 in S₂ and 125.41 in S₃. It may be seen that

in S_1 all the components of total cost are at a higher level than in S_2 or S_3 . The cost of materials and bullock-power, for instance is found to be as high as Rs. 75.41 per acre in S_1 as compared with Rs. 46.07 in S_2 and Rs. 46.12 in S_3 .

It may also be seen from the tables on farm business costs given according to size groups of holdings that the total cost per acre is comparatively high in the lower and middle size groups in all the 3 strata. This has to be attributed to the fact that two important components of total cost, namely human labour and bullock labour have rapidly declined in their ~~output~~^{Volume} in higher size groups. It is also found that hire charges for implements and interest on crop-loans have shown a downward trend as the size group of holdings increases.

(c) Output in crop production

The total output per acre in Crop Production has amounted to Rs. 192.8 in S_1 as compared with Rs. 107.6 in S_2 and Rs. 101.0 in S_3 . It varies considerably between the size groups in the three strata, for instance in S_1 , the output is highest in ^{the} size group of holdings 12.50 - 15.00 acres amounting to Rs. 295.3. In S_2 the highest value of output is only Rs. 137.95, obtained in the size group of holdings 25.00 acres and above. In S_3 ~~the~~ the highest value of output is only Rs. 149.7 which is obtained in the lowest size group of holding. The minimum output is obtained in S_1 and S_2 in the same size group of holding namely 2.51 - 5.00 acres, amounting to Rs. 113.6 and Rs. 82.3 respectively. In S_3 the minimum output of Rs. 74.2 is however obtained in the size group of 12.51 - 15.00 acres. No significant trend is found in the value of output per acre with reference to the size of holding.

(d) Output-input ratio.

The overall output-input ratio in farm business is 1.04 in S_1 as compared with 0.91 in S_2 and 0.81 in S_3 . This shows that farm business in S_2 and S_3 is a loss, if we take into account both variable and fixed costs which have to be covered in the long-run. A study of the distribution of the output-input ratios according to size of holdings reveals that there is a distinctive rising tendency in the ratio in S_1 , the ratio being greater than unity in the higher size groups. No such tendency is to be observed in S_2 except that in the two highest size groups of holdings, the output-input ratio rises to 1.00 and 1.13 respectively. In S_3 also, no rising tendency in the ratio is to be seen and the ratio is less than unity in all the size groups.

(e) Net profit (or loss) in crop production

Net profit is obtained, as already explained, as the surplus of the value of gross produce over Cost C. In Stratum-1, it is found that all the holdings in the 4 higher size groups have received net profit. In S_2 net profit is obtained only in the highest size group of holdings while there is net loss in all the size groups in S_3 . The overall net profit earned in S_1 is Rs. 3.3 per acre while the overall net loss in S_2 and S_3 has amounted to Rs. 10.7 and Rs. 21.4 respectively.

(f) Farm business income

Farm business income i.e. the surplus of the total value of output over Cost A_2 has amounted to Rs. 76.0 per acre in S_1 , Rs. 40.0 in S_2 and Rs. 27.5 in S_3 . We find that farm business income is negative

only in the case of the lowest size group of holdings in S_3 . It is worth noting in this connection that in S_1 the amount of farm business income per acre is nearly 3 times the same in S_3 and nearly 2 times the same in S_2 .

(g) Farm investment income

Farm investment income i.e. the surplus of the total value of output over Cost A_3 (or net returns to owned land and owned capital) has come to Rs.53.3 in S_1 as compared with Rs.23.1 in S_2 and Rs.8.2 in S_3 . The disparity in farm investment income per acre as between the 3 strata is thus found to be even more important than the disparity in farm business income. The farm investment income per acre in S_1 is more than 7 times the same in S_3 and nearly $2\frac{1}{2}$ times the same in S_2 .

(h) Farm family labour income

The overall amount of farm family labour income i.e. the surplus of the total value of output over cost B is highest in S_1 and has come to Rs.26.0 per acre. But it is found to be negative in all the size groups of holdings below 12.51 acres with the single exception of 7.51 - 10.00 acres size group. The overall family labour income in S_2 has come to only Rs.6.2, but in this case also it is negative for all size groups ~~below~~ ^{below} 12.50 acres with the exception of the lowest size group. In contrast ~~to~~ ^{to} S_1 and S_2 the overall farm family labour income has come to be negative in S_3 being Rs.5.1. It is found to be positive only in the two size groups of holdings 15.01 - 20.00 and 20.01 - 25.00 acres.

'i) Value-added to material costs

Value-added to material cost^s including fuel and power is a measure of the efficiency of farm business from the point of view of society and is thus different from the measures already discussed above.

It is the value-added to the intermediate products such as seed, manures and fertilisers, and bullock power and represents returns to human labour, profits to farmer and the shares in gross produce accruing to owners of land and capital. If depreciation on fixed capital is deducted from gross value added, we get the net value added. In stratum-1 the amount of gross value added has come to Rs.117.4 per acres

compared with Rs.61.5 in S_2 and Rs.54.9 in S_3 . The

which is twice or nearly twice the same in the other two strata is largely a measure of the difference between S_1 and the other strata in respect of soil fertility, cropping pattern and cultural practices.

4.3 Input-Output relation in milk production.

Production of milk is an important enterprise undertaken by the farmers in all the 3 strata of the Nagarjunasagar Project area. Milch cattle ~~which~~ include both cows and buffaloes which are in milk or temporarily dry. The number of milch animals maintained per farm is given in table No. 31 (Farm Surveys), which comes to 1.24 in S_1 , 1.43 in S_2 and 1.78 in S_3 . In all the three strata, the number of milch cattle maintained by farmers in the lower size groups of holdings is found to be less than the number maintained by farmers in higher size groups.

The details of total cost of maintenance per milch animal are given in Table No. 35 (Farm Surveys), the two important components of total cost being (1) the value of fodders and feeds (2) labour charges for the

Upkeep of milch animals. The over costs of maintenance ~~of~~ milch animal has come ⁹⁶ to Rs 253.03 in S₁, Rs 211.62 in S₂ and Rs. 106.23 in S₃: The value of fodders and feeds constitutes the highest proportion of the total cost in all the 3 strata labour charge for the upkeep of animals coming next in order of importance.

It is also found that the cost of maintenance per milch animal shows a decreasing tendency as the size group of holdings increases in S₁, but such a tendency is, however, not found in the other two strata.

The yield of milk per animal taking both the animals in milk and those which are temporarily dry has amounted to 249 seers per year in S₁, 183.7 in S₂, and 72.3 seers in S₃. The poor yield of milk per animal in S₂ and S₃ is to be attributed to the poor quality and feeding of the animals. Details of cost of maintenance and output of milk per milch animal are given in the following table No. 4.3

Table No. 4.3

Maintenance cost and value of output in Milk Production per milch animal (in Rs.)

Item	S ₁	S ₂	S ₃
1. Value of fodders and feeds	117.55	92.65	42.33
2. Upkeep labour charges	115.51	100.52	42.80
3. Other charges	19.97	18.45	14.10
Total cost of maintenance	253.03	211.62	106.23
4. Value of milk output per farm	155.00	132.00	62.84

4.4. Irrigated paddy.

Irrigated paddy is extensively cultivated in S_3 the sources of irrigation being mostly ^{canals and wells.} It is also cultivated in S_2 , though ~~to a lesser extent.~~ In stratum 3 some area is under irrigated paddy for which water is given from the canals of ^{the} Palair river. The area under the crop in S_3 constitutes 9.14% of the gross cropped area and 50 per cent of the sample cultivators have raised irrigated paddy. Generally, water is available to raise irrigated paddy as a winter crop only, although in a few places it is raised as a summer crop under well irrigation. In the S_2 villages the area under paddy forms only less than 2% of the gross cropped area. In the whole project area, the irrigated paddy is raised by adopting the practice of transplantation of seedlings, although in some places in S_3 , broad-cast sowing is still found. Farm-yard manure is the principal type of manure used in raising irrigated paddy, the rate of application of farm yard manure ranging from 5 to 20 cartloads per acre.

The total cost of cultivation of irrigated paddy has amounted to Rs. 360.69 per acre in S_3 villages as compared to Rs. 261.64 in S_2 . The higher cost of cultivation in S_3 is found to be due to the higher inputs of bullock labour and human labour. The cost of bullock labour input per acre has come to Rs. 72.96 in S_3 (20.23% of the total cost) as compared with Rs. 40.87 per acre in S_2 (15.62% ^{of the} total cost). Similarly the cost of human labour input has come to Rs. 78.82 in S_2 (29.74% of the total cost) as compared with Rs. 118.16 per acre in S_3 (32.75% of the total cost). The difference in the total cost of cultivation between the two areas is also to be attributed to the considerable difference in output per acre, the average yield per acre in S_3 being 1861 lbs. as compared with 1124 lbs. per acre in S_2 . A detailed breakdown of total cost is given in the table ~~at~~ ^{No 4.4.}

The estimated gross output per acre in S_3 has come to Rs. 335.25 including the by-product valued at Rs. 52.62. In S_2 , it has amounted to Rs. 241.83 including the byproduct valued at Rs. 47.26. In S_3 the yield per acre has varied between ~~11.24~~ ^{1349 lbs.} and ~~6.18~~ ^{2517 lbs.} quintals as between the size groups of holdings. The range of variation in S_2 villages is however considerably more than in S_3 , the range being from ~~10.87~~ ^{2378 lbs} to ~~12.01~~ ^{407 lbs.} quintals per acre. On cost 'C' basis i.e. taking into account all the variable and fixed cost, including the imputed values of farm family labour, rental value of owned land, etc., there is an overall loss of Rs. 25.44 per acre in S_3 villages as compared with an overall loss of Rs. 19.81 in S_2 villages. We find, however, that the amount of net output after deducting the cost of materials, fuel and power and the cost of hired labour has amounted to Rs. 140.58 per acre in S_3 villages and Rs. 116.8 in S_2 .

A few important features of physical inputs of human labour and bullock labour in the two strata are also worth noting. The average input of human labour in S_3 villages, has come to 72.98 mandays per acre of which hired labour constitutes 43.48 mandays. In S_2 the total input of human labour is 67.59 mandays and out of this 39.50 mandays constitute hired labour. We thus find that the input of human labour per acre for cultivation of irrigated paddy is not materially different between the two strata; but it is considerably higher than the input in the delta areas of coastal Andhra Pradesh. For example, Studies in the Economics of Farm Management in the West Godavari District have shown that the physical labour input varied from 39.37 to 54.71 mandays between 1957-58 and 1959-60. The input of bullock labour is also found to be considerably high in S_3 , the total number of bullock-pair days amounting to 21.51 per acre and the range of variation between the size groups is from 17.6 to 41.85 days. Almost the entire input of bullock labour in S_3 is owned bullock labour. In S_2 however, the total input of ~~bullock~~

bullock labour is observed to be only 7 days per acre which is nearly the same as reported in the Studies in the Economics ^{of} Farm Management in the West Godavari district.

Table 4.4.

Cost of cultivation of Irrigated Paddy per acre (in Rs.)

	<u>S₂</u>		<u>S₃</u>	
	<u>Cost(Rs.)</u>	<u>Percent</u>	<u>Cost(Rs.)</u>	<u>Percent</u>
<u>1. Human labour</u>				
a. Family labour	39.18	14.97	56.61	15.69
b. Hired Labour	<u>38.64</u>	<u>14.77</u>	<u>61.55</u>	<u>17.06</u>
<u>2. Cost of materials,</u>	78.82	29.74	118.16	32.75
<u> Fuel and power:</u>				
Seed	31.38	11.99	29.46	8.17
Manures and ferti- lisers	13.14	5.02	28.22	7.82
Bullock labour	40.87	15.62	72.96	20.23
Hire charges for implements	0.78	0.30	0.10	0.03
Pesticides	--	--	--	--
Fuel	--	--	--	--
Interest on crop loans	0.20	0.08	2.38	0.66
	<u>86.37</u>	<u>53.01</u>	<u>133.12</u>	<u>36.91</u>
<u>3. Interest and Rent.</u>				
Rental value or rent	87.12	33.30	95.98	26.61
Interest on capital	0.36	0.14	1.00	0.28
<u>4. Land Revenue and cesses</u>	7.50	2.87	6.70	1.94
<u>5. Depreciation on Capital</u>	2.47	0.94	5.44	1.51
<u>Total,.</u>	<u>261.64</u>	<u>100.00</u>	<u>360.69</u>	<u>100.00</u>

Table No. 4.5.
Human Labour per Acre (8 Hr. Mandays)

Size group (in acres)	Stratum - 2.			Stratum - 3.		
	Family labour	Hired labour	Total	Family labour	Hired labour	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.01 - 1.00	45.84	26.33	72.17	54.28	62.22	116.45
1.01 - 2.50	24.70	86.75	111.45	41.48	36.02	77.50
2.51 - 5.00	43.65	69.66	113.31	34.82	41.66	76.48
5.01 - 7.50	17.02	48.29	65.31	37.63	32.93	70.56
7.51 - 10.00	39.80	26.08	65.88	32.57	53.83	86.40
10.01 - 12.50	7.33	27.94	35.27	50.88	29.87	80.75
12.51 - 15.00	59.30	22.53	81.83	33.60	40.79	74.39
15.01 - 20.00	52.35	34.58	86.93	24.33	38.71	63.04
20.01 - 25.00	36.47	18.94	55.41	22.75	48.95	71.70
Above 25.00	12.17	29.57	41.74	13.71	45.89	59.60
Total	28.09	39.50	67.59	29.50	43.48	72.98

Table No. 14.6.

Bullock labour per acre (8 hr. Bullock pair days)

Size group (in acres)	Stratum - 2.			Stratum - 3.		
	owned	Hired	Total	Owned	Hired	Total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.01 - 1.00	6.67	6.67	13.34	25.87	--	25.87
1.01 - 2.50	--	4.75	4.75	22.94	0.80	23.74
2.51 - 5.00	4.93	2.37	7.30	22.46	0.60	23.06
5.01 - 7.50	2.26	4.04	6.30	24.18	1.31	25.49
7.51 - 10.00	2.14	4.82	6.96	19.70	--	19.70
10.01 - 12.50	0.62	3.65	4.27	41.85	--	41.85
12.51 - 15.00	12.50	--	12.50	19.13	--	19.13
15.01 - 20.00	9.84	--	9.84	23.00	--	23.00
20.01 - 25.00	6.44	--	6.44	15.24	--	15.24
Above 25.00	7.92	--	7.92	17.60	--	17.60
Total	4.78	2.30	7.08	21.21	0.30	21.51

Table No. 47.Total cost and output per acre (in Rs.)

Size group (in acres)	Stratum 2.			Stratum 3			Yield per acre (in lbs)	
	Total cost	Output	Profit or loss	Total cost	Output	Profit (or loss)	S ₂	S ₃
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0.01 - 1.00	242.08	266.68	24.60	571.22	314.98	-256.24	1064.8	1867.8
1.01 - 2.50	281.36	330.00	48.64	420.09	310.62	-109.47	1916.2	1775.4
2.51 - 5.00	248.38	87.97	-160.41	378.80	301.53	- 77.27	407.0	1740.2
5.01 - 7.50	272.31	296.85	24.54	334.65	246.44	- 88.21	1445.4	1348.6
7.51 - 10.00	323.97	412.98	89.01	466.58	434.58	- 32.00	2167.0	2516.8
10.01 - 12.50	202.33	95.83	-106.50	347.40	286.72	- 60.68	398.2	1511.4
12.51 - 15.00	492.23	420.21	72.02	418.22	242.19	-176.03	2081.2	1390.4
15.01 - 20.00	305.56	504.34	198.78	272.04	382.51	-110.47	2378.2	1980.0
20.01 - 25.00	245.24	304.34	59.10	299.50	259.42	- 10.08	1289.2	1656.6
Above 25.00	167.12	280.01	112.89	314.35	359.17	44.82	1278.2	2039.4
Total	261.64	241.83	-19.81	360.69	335.25	- 25.44	1124.2	1878.8 1860.6

4.5. Un-irrigated Paddy.

Un-irrigated paddy is raised as a kharif crop mainly on the Right Bank Canal Area of the Project, i.e., in S₁ villages. In the sample~~x~~ farm households of Stratum-1 the area under this crop came to 18.71 acres, constituting only 1.62% of the gross cropped area.

The total cost of cultivation of un-irrigated paddy has amounted to Rs.140.06 per acre, of which the cost of materials and bullock labour amounted to 36.7% and the cost of human labour to 21.3%. The absolute cost of human labour and bullock labour amounted to Rs.29.79 and Rs.16.84 per acre respectively.

The estimated gross output per acre amounted to Rs.89.79 per acre, involving an overall net loss of Rs.50.27. The value of the by-product is Rs.21.16. The grain yield per acre amounted to only 563 lbs.

The total input of human labour came to 24.57 mandays per acre of which 14.27 days constituted hired labour. The input of bullock labour which is mainly owned bullock labour came to 4.62 bullock-pair days only. Unirrigated paddy is thus found to be an enterprise associated with low levels of input as well as output in comparison with irrigated paddy.

Table No. 4.8.

Cost of cultivation of Unirrigated Paddy per acre

	<u>Cost (Rs.)</u>	<u>Percentage to Total,</u>
<u>1. Human labour</u>		
a. Family labour	16.47	11.76
b. Hired labour	13.32	9.51
	<u>29.79</u>	<u>21.27</u>
<u>2. Cost of materials</u>		
<u>Fuel and power</u>		
Seed	6.26	4.47
Manures and fertilizer	27.90	19.92
Bullock labour	16.84	12.02
Hire charges for implements	0.29	0.21
Pesticides	--	--
Fuel	--	--
Interest on crop loan	0.15	0.11
	<u>51.44</u>	<u>36.73</u>
<u>3. Interest and Rent</u>		
Rental value or Rent	53.31	38.05
Interest on capital	0.47	0.34
<u>4. Land Revenue & Cesses</u>	2.22	1.59
<u>5. Depreciation on Capital</u>	2.83	2.02
	<u>140.06</u>	<u>100.00</u>

Table No. 4.9.

Input of human labour per acre (8 hour mandays)

<u>Size group</u> <u>(in acres)</u>	<u>Family labour</u>	<u>Hired labour</u>	<u>Total</u>
(1)	(2)	(3)	(4)
0.01 - 1.00	--	--	--
1.01 - 2.50	30.31	8.13	38.44
2.51 - 5.00	11.71	44.83	56.54
5.01 - 7.50	4.97	19.33	24.30
7.51 - 10.00	15.78	3.00	18.78
10.01 - 12.50	24.54	20.36	44.90
12.51 - 15.00	17.61	23.82	41.43
15.01 - 20.00	5.25	13.29	18.54
20.01 - 25.00	10.15	1.50	11.65
Above 25.00	0.92	1.58	2.50
<u>Total</u>	<u>10.30</u>	<u>14.27</u>	<u>24.57</u>

Table No. 4.10.

Input of bullock labour per acre (8 hr. bullock pair days)

Size group (in acres)	Owned	Hired	Total
(1)	(2)	(3)	(4)
0.01 - 1.00	--	--	--
1.01 - 2.50	--	3.13	3.13
2.51 - 5.00	2.56	2.99	5.55
5.01 - 7.50	2.80	1.30	4.10
7.51 - 10.00	3.67	--	3.67
10.01 - 12.50	3.70	--	3.70
12.51 - 15.00	7.86	--	7.86
15.01 - 20.00	1.14	1.88	3.02
20.01 - 25.00	5.82	--	5.82
25.01 - 30.00	2.12	--	2.12
Total	3.72	0.90	4.62

Table No. 4.11

Total cost and output per acre (in Rs.)

Size group (in acres)	Total cost	Output	Profit or loss	Yield (in lbs.)
(1)	(2)	(3)	(4)	(5)
0.01 - 1.00	--	--	--	--
1.01 - 2.50	163.90	65.00	-99.90	369.6
2.51 - 5.00	141.98	72.65	-69.33	429.0
5.01 - 7.50	135.57	170.40	+34.83	871.2
7.51 - 10.00	130.20	306.66	+176.46	1788.6
10.01 - 12.50	187.53	83.20	-104.33	536.8
12.51 - 15.00	254.32	91.43	-162.89	521.4
15.01 - 20.00	110.50	97.52	-12.98	479.6
20.01 - 25.00	96.03	10.00	-86.03	63.8
Above 25.00	86.01	54.67	-31.34	167.2
Total	140.06	89.79	-50.27	563.2

4. 6. Bajra.

Bajra is another cereal crop extensively raised in S_2 and S_3 villages, and it is commonly raised as a crop mixed with redgram or cotton. It does not appear to be an important crop in S_1 villages.

The total cost of cultivation per acre of bajra has come to Rs.133.42 in S_2 and Rs.44.31 in S_3 . The comparatively high cost of cultivation in S_2 , which is nearly 3 times the cost in S_3 , is due to the higher level of inputs of labour and materials and also of the high rental values of land in S_2 . For instance the cost of materials and bullock power has amounted to Rs.46.25 in S_2 as compared with Rs.19.91 in S_3 . The cost of human labour amounted to Rs.32.41 in S_2 as compared to Rs.11.80 in S_3 .

The total output of bajra in S_2 has amounted to Rs.113.35 as compared with Rs.34.82 in S_3 . In both S_2 and S_3 there is thus a net loss per acre on cost 'C' basis. Taking into account only the cost of materials, bullock labour and hired human labour, we find that the total output net of these costs has amounted to Rs.53.93 in S_2 and Rs.10.75 in S_3 . The enormous difference between the two areas S_2 and S_3 in respect of inputs and output for this crop has to be largely attributed to the difference in yields per acre. In S_2 the overall yield per acre amounted to 575 lbs. the range of variation being from 213.4lbs. to 902.0 lbs. in the different size groups of holdings. As compared with this position we find that in S_3 the overall yield per acre has amounted to 130.1 lbs. only, the range of variation in the size groups of holdings being from 39.6 to 574.2 lbs.

The physical input of human labour has come to 19.03 mandays per acre in S_2 as compared with 7.55 mandays in S_3 . Similarly in the case of bullock labour, the input per acre in S_2 amounted to 6.90 bullock pairdays per acre as compared with 3.37 days in S_3 .

Table No. 4.12

/67

Cost of cultivation of Bajra per acre (in Rs.)

Item	S ₂		S ₃	
	Cost (Rs.)	% to Total	Cost (Rs.)	% to Total
(1)	(2)	(3)	(4)	(5)
1. Human labour.				
a. Family labour	19.28	14.45	7.64	17.24
b. Hired labour	13.13	9.84	4.16	9.39
	32.41	24.29	22.80 11.80	26.63
2. Cost of materials:				
<u>Fuel and Power,</u>				
Seed	2.10	1.57	1.83	4.13
Manures and fertilisers	13.31	9.98	5.22	11.78
Bullock labour	30.18	22.62	12.32	27.81
Hirecharges for implements	0.65	0.49	0.06	0.14
Pesticides	--	--	--	--
Fuel	--	--	--	--
Interest on crop loans	0.01	0.01	0.48	1.08
	46.25	34.67	19.91	44.94
3. Interest and Rent,				
Rental value or Rent	49.29	36.94	10.77	24.30
Interest on capital	0.66	0.49	0.16	0.36
4. Land Revenue and Cesses				
	1.73	1.30	0.69	1.56
5. Depreciation on capital				
	3.08	2.31	0.98	2.21
Total	133.42	100.00	44.31	100.00

Table No. 4.13
Human labour per acre (8 hr. mandays)

Size group (in acres)	STRATUM - 2			STRATUM - 3		
	Family labour	Hired Labour	Total	Family Labour	Hired Labour	Total
0.01 - 1.00	9.55	17.10	26.65	--	--	--
1.01 - 2.50	6.29	22.53	28.82	2.02	1.02	3.04
2.51 - 5.00	4.88	8.19	13.07	5.11	4.71	9.82
5.01 - 7.50	15.45	9.40	24.85	5.40	1.96	7.36
7.51 - 10.00	15.04	4.36	19.40	9.61	0.22	9.83
10.01 - 12.50	15.30	13.55	28.85	6.46	1.84	8.30
12.51 - 15.00	14.43	13.42	27.85	2.83	2.43	5.26
15.01 - 20.00	5.58	5.02	10.60	7.01	1.60	8.61
20.01 - 25.00	6.70	7.96	14.66	4.51	4.41	8.92
Above 25.00	1.90	13.75	15.65	0.25	9.48	9.73
Total	9.05	9.98	19.03	5.01	2.54	7.55

Table No. 4.14.
Bullock labour per acre (8 hr. pair days)

Size group (in acres)	Stratum-2			Stratum - 3.		
	Owned	Hired	Total	Owned	Hired	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.01 - 1.00	4.51	2.82	7.33	--	--	--
1.01 - 2.50	0.46	6.45	6.91	0.94	0.69	1.63
2.51 - 5.00	2.28	1.15	3.43	3.86	--	3.86
5.01 - 7.50	11.99	2.13	14.12	2.77	0.14	2.91
7.51 - 10.00	7.57	0.42	7.99	4.82	--	4.82
10.01 - 12.50	11.14	--	11.14	3.34	--	3.34
12.51 - 15.00	10.29	--	10.29	2.61	--	2.61
15.01 - 20.00	4.41	--	4.41	3.88	--	3.88
20.01 - 25.00	4.50	--	4.50	4.47	--	4.47
Above 25.00	2.65	--	2.65	5.83	--	5.83
Total	5.92	0.98	6.90	3.26	0.11	3.37

Table No. 4.15.

Total cost and output per acre (in Rupees)

Size group (in acres)	Stratum - 2			Stratum - 3			Yield per acre (in lbs.)	
	Total cost	Output	Profit or Loss	Total Cost	Output	Profit or Loss	S ₂	S ₃
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0.01 - 1.00	169.90	144.44	-25.46	--	--	--	902.0	--
1.01 - 2.50	203.08	160.03	-43.05	21.32	9.80	-11.52	864.6	39.6
2.51 - 5.00	116.23	93.71	-22.52	46.00	47.43	- 1.43	497.2	191.4
5.01 - 7.50	193.35	97.73	-95.62	45.69	36.54	- 9.15	565.4	125.4
7.51 - 10.00	130.61	108.59	-22.02	37.99	48.69	-10.70	591.8	224.4
10.01 - 12.50	179.58	177.57	- 2.01	47.99	35.52	-12.47	996.6	129.8
12.51 - 15.00	167.27	128.90	-38.47	32.06	29.22	- 2.84	708.4	574.2
15.01 - 20.00	68.39	37.92	-30.47	68.15	22.33	-45.82	213.4	107.8
20.01 - 25.00	122.78	136.73	13.95	42.92	48.16	5.24	741.0	193.6
Above 25.00	87.73	97.85	10.12	56.39	20.00	-36.39	440.0	81.4
Total	133.42	113.35	-20.07	44.31	34.81	-9.49	575.0	130.1

4.7. Variga.

Variga is a crop coming under the description of small millets and is extensively grown in the S₁ and S₂ villages. It is sometimes raised as a crop mixed with jowar.

The total cost of cultivation of variga per acre came to Rs.154.91 in S₁ and Rs.145.71 in S₂. The cost of materials and bullock labour amounted to Rs.83.06 and Rs.63.66 respectively in the two areas. The cost of human labour amounted to Rs.24.29 in S₁ and Rs.27.72 in S₂. The total output per acre has amounted to Rs.119.01 in S₁ and Rs.116.81 in S₂, including the values of the by-product of Rs.22.36 and Rs.32.68 in S₁ and S₂ respectively. On cost 'C' basis, there is a net loss of Rs.35.90 per acre in S₁ and Rs.28.90 in S₂. The gross output per acre net of material costs, bullock labour and hired human labour, comes to Rs.24.83 in S₁ and Rs.41.09 in S₂. The grain yield of variga per acre is 633 lbs. in S₁ and 562 lbs. in S₂. It varies between 1278 lbs. and 433 lbs. and between 719 lbs. and 405 lbs. in S₁ and S₂ respectively.

The physical input of human labour has come to 15.61 mandays in S₁ and 18.41 mandays in S₂. The input of bullock labour came to 6.48 bullock pairdays in S₁ and 7.38 bullock pairdays in S₂.

Table No. 4.16.

Cost of cultivation of Variga per acre (in Rs.)

Item.	S ₁		S ₂	
	Cost(Rs.)	% to Total	Cost(Rs.)	% to Total
(1)	(2)	(3)	(4)	(5)
1. Human labour				
a. Family labour	13.17	8.51	15.66	10.75
b. Hired labour	11.12	7.18	12.06	8.28
	24.29	15.69	27.72	19.03
2. Cost of materials				
<u>Fuel and Power.</u>				
Seed	2.43	1.57	3.14	2.15
Manures & Fertilisers	39.46	25.49	26.63	18.28
Bullock labour	40.18	25.95	33.45	22.96
Hired charges for implements	0.99	0.64	0.30	0.21
Pesticides	--	--	--	--
Fuel	--	--	--	--
Interest on crop loan	--	--	0.14	0.09
	83.06	53.65	63.66	43.69
3. Interest and Rent				
Rental value or Rent	40.34	26.06	48.25	33.11
Interest on capital	1.00	0.65	0.72	0.49
4. Land Revenue and Cesses				
	1.86	1.20	2.35	1.61
5. Depreciation on Capital				
	5.26	2.75	3.01	2.07
Total	154.91	100.00	145.71	100.00

Table No. 4.17

Human labour per acre (in 8 hr. mandays)

Size Group (in acres)	Stratum - 1			Stratum - 2		
	Family Labour	Hired Labour	Total	Family Labour	Hired Labour	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.01 - 1.00	9.24	8.41	17.65	4.96	24.31	29.27
1.01 - 2.50	6.15	13.55	19.70	11.12	14.72	25.84
2.51 - 5.00	6.34	10.53	16.87	8.31	9.97	18.28
5.01 - 7.50	6.72	9.37	16.09	9.77	5.96	15.73
7.51 - 10.00	14.19	3.09	17.28	12.12	4.60	16.72
10.01 - 12.50	15.94	8.82	24.76	11.88	6.04	17.92
12.51 - 15.00	14.56	2.49	17.05	7.89	8.20	16.92
15.01 - 20.00	8.72	4.83	13.55	11.29	8.68	19.97
20.01 - 25.00	7.44	6.17	13.61	10.62	8.55	19.17
Above 25.00	3.04	11.00	14.04	4.50	13.33	17.83
Total	7.69	7.92	15.61	8.90	9.51	18.41

Table No. 4.18

Bullock labour per acre (8 hr. pair days)

Size Group (in acres)	Stratum - 1			Stratum - 2		
	Owned	Hired	Total	Owned	Hired	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.01 - 1.00	2.57	4.59	7.16	0.80	6.80	7.60
1.01 - 2.50	1.65	6.27	7.92	2.50	6.83	9.33
2.51 - 5.00	1.29	4.63	5.92	3.58	3.87	7.45
5.01 - 7.50	3.23	3.45	6.68	5.85	4.78	10.63
7.51 - 10.00	7.14	0.35	7.49	5.85	0.83	5.88
10.01 - 12.50	10.81	--	10.81	8.32	0.49	8.81
12.51 - 15.00	6.61	--	6.61	6.87	--	6.87
15.01 - 20.00	7.02	--	7.02	8.10	--	8.10
20.01 - 25.00	4.82	--	4.82	6.41	--	6.41
Above 25.00	5.30	--	5.30	7.09	--	7.09
Total	5.25	1.23	6.48	6.69	0.69	7.38

Table No. 4.19

Total cost and output per acre (in Rs.)

Size group (in acres)	Stratum - 1			Stratum - 2			Yield (in lbs.)	
	Total Cost	Output	Profit or Loss	Total Cost	Output	Profit or Loss	S ₁	S ₂
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0.01 - 1.00	104.33	140.83	36.50	144.26	106.40	-37.86	794.2	574.2
1.01 - 2.50	150.27	94.63	-55.64	162.31	73.33	-88.98	501.6	404.8
2.51 - 5.00	127.09	97.84	-29.25	148.28	99.95	-48.33	583.0	587.4
5.01 - 7.50	163.38	129.72	-33.66	152.51	94.26	-58.25	728.2	530.2
7.51 - 10.00	210.65	96.46	-114.19	134.68	89.17	-45.51	675.4	455.4
10.01 - 12.50	358.52	161.41 81.83	-276.89	115.40	99.47	-15.93	534.6	470.8
12.51 - 15.00	161.41	147.15	-14.26	127.45	112.62	-14.83	629.2	719.4
15.01 - 20.00	129.33	73.78	-55.55	162.32	105.41	-56.91	433.4	532.4
20.01 - 25.00	92.38	141.33	48.95	134.97	111.61	-23.36	578.6	569.8
Above 25.00	153.36	201.90	48.54	151.61	129.95	-21.66	1278.2	684.2
Total	154.91	119.01	-35.90	145.71	116.81	-28.90	633.4	562.2

4.8. Ragi.

Ragi is another important crop raised in S₂ coming under the description of millets. It is cultivated under well irrigation in S₂. It is generally sown during September/October and harvested in December/January, and it is usually preceded by crops such as jowar or bajra.

The overall average cost per acre of ragi has amounted to Rs. 330.82 of which human labour came to Rs. 131.34 (39.70%) and the cost of materials and bullock power amounted to Rs. 131.40 (39.73%)

The gross output has come to Rs. 248.60 per acre involving a net loss of Rs. 82.22 per acre. The gross output net of cost of materials, bullock power and hired-human labour has come to Rs. 74.16 per acre. The overall yield per acre is 1274 lbs, the yield among size groups varying from 898 lbs to 2400 lbs. The input of human labour per acre is 85.66 mandays and that of the bullock labour 26.86 pair days.

Table No. 4.20
Cost of cultivation of Ragi per acre.

	S ₂	
	Cost(Rs.)	% to Total
1. <u>Human labour</u>		
a. Family labour	88.30	26.69
b. Hired labour	43.04	13.01
2. <u>Cost of materials</u>	131.34	39.70
<u>Fuel and Power</u>		
Seed	6.60	2.00
Manures & Fertilisers	35.76	10.81
Bullock labour	87.83	26.55
Hire charges for implements	1.18	0.36
Pesticides	--	--
Fuel	--	--
Interest on Crop loans	0.03	0.01
	131.40	39.73
3. <u>Interest and Rent</u>		
Rental value or Rent	59.17	17.88
Interest on Capital	1.01	0.30
4. Land revenue & Cesses	1.12	0.34
5. Depreciation on capital	6.78	2.05
	330.82	100.00

Table No. 4.21.

Human labour per acre (8 hr. mandays)

Sizegroup (in acres)	Family Labour	Hired Labour	Total
0.01 - 1.00	44.93	36.49	81.42
1.01 - 2.50	5.37	44.28	49.65
2.51 - 5.00	--	92.33	92.33
5.01 - 7.50	48.13	31.24	79.37
7.51 - 10.00	38.31	28.82	67.13
10.01 - 12.50	51.83	35.40	87.23
12.51 - 15.00	49.66	48.00	97.66
15.01 - 20.00	106.36	44.00	150.36
20.01 - 25.00	67.85	35.19	103.04
Above 25.00	--	--	--
Total	48.58	37.08	85.66

Table No. 4.22

Bullock labour per acre (8 hr. pairdays)

Size Group (in acres)	Owned	Hired	Total
(1)	(2)	(3)	(4)
0.01 - 1.00	5.55	9.76	15.31
1.01 - 2.50	--	12.50	12.50
2.51 - 5.00	--	26.67	26.67
5.01 - 7.51	22.67	--	22.67
7.51 - 10.00	15.60	--	15.60
10.01 - 12.50	30.01	--	30.01
12.51 - 15.00	31.78	--	31.78
15.01 - 20.00	69.00	--	69.00
20.01 - 25.00	34.84	--	34.84
Above 25.00	--	--	--
Total	25.36	1.50	26.86

Table No. 4.23

Total cost and output per acre of Ragi
(in Rs.)

Size Group (in acres)	Stratum - 2			Yield per acre (in lbs.)
	Total Cost	Output	Profit or Loss	S ₂
(1)	(2)	(3)	(4)	(5)
0.01 - 1.00	261.70	228.09	-33.61	898
1.01 - 2.50	186.24	224.18	+37.94	1074
2.51 - 5.00	145.57	206.66	+121.09	1334
5.01 - 7.50	354.31	211.78 294.83	-59.54	1580
7.51 - 10.00	278.63	211.78	-66.85	1112
10.01 - 12.50	295.00	247.15	-47.85	1288
12.51 - 15.00	398.86	300.70	-98.16	1644
15.01 - 20.00	588.09	405.00	-183.09	2400
20.01 - 25.00	419.78	297.42	-122.36	1448
Above 25.00	--	--	--	--
Total	330.82	248.60	-82.22	1274

4.9. Jowar.

This study of input-output relation in the case of cultivation of Jowar is confined only to the crop sown in Sept./Oct., and harvested in February/March because the crop sown earlier in July/August is mostly used as a fodder crop. Jowar is an important cereal crop extensively raised in all parts of the project area. In the S₁ villages, 51 out of the 140 sample farmers are raising the jowar crop, the area under the crop accounting for 24% of the gross cropped area. Similarly in S₂ and S₃, a high ^{proportion} ~~population~~ of the cropped area is under jowar.

The total cost of cultivation of jowar per acre has amounted to Rs.183.06 in S₁ as compared with Rs.133.86 in S₂ and Rs.71.04 in S₃. The cost of materials and bullock power amounted to Rs.61.27, 44.69, and 26.03 in the three Strata respectively. The cost of human labour in S₁ is Rs.28.47 as compared with Rs.31.69 in S₂ and Rs.23.06 in S₃. The

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rental value of owned land and rent paid out on leased land together amounted to Rs. 84.63 in S_1 and Rs. 50.20 in S_2 and Rs. 19.13 in S_3 . The comparatively high cost of cultivation of jowar in S_1 has thus to be attributed to the high rents on land and the high cost of materials and bullock labour.

The gross output of jowar including the value of the by-product came to Rs. 157.21 in the S_1 villages as compared with Rs. 107.56 in S_2 and Rs. 61.34 in S_3 . The overall position is thus a net loss in all the 3 strata amounting to Rs. 28.85, Rs. 26.08 and Rs. 9.70 respectively in the 3 strata. The gross output net of cost of materials, bullock power and hired human labour, however, comes to Rs. 82.22 per acre in S_1 as compared with Rs. 50.98 in S_2 and Rs. 27.99 in S_3 .

The grain yield of jowar per acre came to 662 lbs in S_1 , 563 lbs in S_2 , and 284 lbs. in S_3 . The yield varies between 878 lbs. and 286 lbs. per acre in S_1 as between the different size groups of holdings. In S_2 the variation is between 1192 lbs and 356 lbs. and in S_3 between 541 lbs and 209 lbs. The yields in S_3 are thus comparatively poor.

The physical input of human labour for jowar is nearly the same in S_1 and S_2 but considerably low in S_3 . In S_1 the total input of ^{human} labour has come to 20.53 mandays of which a little more than half constitutes hired labour. In S_2 the total input of human labour is 22.78 mandays while it is only 13.4 mandays in S_3 . The proportion of hired labour in S_3 is considerably higher than in S_1 and S_2 . In the case of bullock labour ^{there} is not much difference to be seen between S_1 and S_2 on the one hand and S_3 on the other. The total number of bullock pair days has come to 6.37 in S_1 , 7.36 in S_2 and 5.23 in S_3 .

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Table No. 4.24.

Cost of cultivation of Jowar per acre

Item	S ₁		S ₂		S ₃	
	Cost Rs.	% to Total	Cost Rs.	% to Total	Cost Rs.	% to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Human labour						
a. Family Labour	14.75	8.06	19.80	14.82	15.74	22.16
b. Hired Labour	13.72	7.49	11.89	8.90	7.32	10.30
	28.47	15.55	31.69	23.72	23.06	32.46
2. Cost of materials,						
<u>Fuel and Power.</u>						
Seed	2.58	1.41	2.64	1.98	2.54	3.58
Manures & Fertilisers	21.00	11.47	8.06	6.03	4.47	6.29
Bullock Labour	35.04	19.14	33.34	24.94	18.82	26.49
Hire charges for implements	2.65	1.45	0.65	0.49	0.07	0.10
Pesticides	--	--	--	--	--	--
Fuel	--	--	--	--	--	--
Interest on Crop loan	--	--	--	--	0.13	0.18
	61.27	33.47	44.69	33.44	26.03	36.64
3. Interest and Rent.						
Rent value or Rent	84.63	46.23	50.20	37.55	19.13	26.94
Interest on Capital	0.91	0.50	1.25	0.94	0.30	0.42
4. Land Revenue & Cesses						
	2.84	1.55	2.03	1.52	0.89	1.25
5. Depreciation on capital						
	4.94	2.70	3.78	2.83	1.63	2.25
Total	183.06	100.00	133.64	100.00	71.04	100.00

Table No. 4.25.

Human labour per acre (in 8 hr. Mandays)

Size Group (in acres)	Stratum - 1			Stratum - 2			Stratum - 3.		
	Family Labour	Hired Labour	Total	Family Labour	Hired Labour	Total	Family Labour	Hired Labour	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
0.01 - 1.00	6.85	2.08	8.93	4.38	15.38	17.96	34.98	3.33	38.31
1.01 - 2.50	12.05	13.57	25.62	8.62	7.53	16.15	14.28	2.52	16.80
2.51 - 5.00	9.75	10.93	20.68	28.59	7.93	36.52	11.28	4.18	15.46
5.01 - 7.50	11.05	9.92	20.97	21.42	4.38	25.80	10.18	3.03	13.21
7.51 - 10.00	15.10	8.45	23.55	24.82	9.68	34.50	7.45	5.74	13.19
10.01 - 12.50	14.59	6.61	21.20	--	--	--	9.64	3.92	13.56
12.51 - 15.00	9.06	6.34	15.40	7.62	13.83	21.45	4.32	5.19	9.51
15.01 - 20.00	6.90	19.20	26.10	5.66	7.01	12.67	5.50	5.05	10.55
20.01 - 25.00	--	--	--	6.89	10.93	17.82	6.49	7.34	13.83
Above 25.00	0.77	16.28	17.05	11.56	13.15	24.71	6.10	10.89	16.99
Total	10.01	10.52	20.53	13.05	9.73	22.78	8.35	5.05	13.40

Table No. 4.26.

Bullock labour per acre (8hr. pair days)

Size Group (in acres)	Stratum - 1.			Stratum - 2.			Stratum - 3.		
	Owned	Hired	Total	Owned	Hired	Total	Owned	Hired	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
0.01 - 1.00	--	7.10	7.10	--	5.20	5.20	0.28	5.83	6.11
1.01 - 2.50	3.08	5.45	8.53	1.33	3.92	5.25	4.26	1.44	5.70
2.51 - 5.00	3.08	3.14		3.08	5.65	8.73	3.43	0.22	3.65
5.01 - 7.50	3.41	3.06	6.47	7.59	1.33	8.92	5.72	--	5.72
7.51 - 10.00	5.93	--	5.93	13.75	--	13.75	5.46	0.63	6.09
10.01 - 12.50	5.40	1.17	6.57	--	--	--	6.25	--	6.25
12.51 - 15.00	5.41	--	5.41	3.42	--	3.42	3.47	--	3.47
15.01 - 20.00	6.98	--	6.98	6.43	--	6.43	4.77	--	4.77
20.01 - 25.00	--	--	--	3.78	--	3.78	5.38	--	5.38
Above 25.00	3.78	0.74	4.52	12.41	--	12.41	0.57	--	0.57
Total	4.41	1.96	6.37	6.14	1.22	7.36	5.05	0.18	5.23

Table No. 4.27.

Total Cost and output per acre (in Rs.)

Size-Group (in acres)	Stratum-1			Stratum-2			Stratum-3			Yield (in lbs.)		
	Total Cost	Output	Profit or Loss	Total Cost	Output	Profit Or Loss	Total Cost	Output	Profit or loss	S ₁	S ₂	S ₃
0.01 - 1.00	238.55	198.78	-39.77	126.38	124.32	- 2.06	146.56	62.62	62.62 -83.94	873.4	589.6	231.0
1.01 - 2.50	209.33	327.84	118.51	119.98	91.74	-28.24	108.64	53.39	-55.25	877.8	475.2	272.8
2.51 - 5.00	223.28	169.77	-53.51	178.84	98.85	-79.99	83.12	49.60	-33.52	781.0	517.0	209.0
5.01 - 7.50	190.06	148.33	-41.73	177.92	94.58	-83.34	67.47	53.84	-13.63	662.2	528.0	224.4
7.51 - 10.00	140.14	79.66	-60.48	143.20	196.00	52.20	69.20	88.14	19.04	286.0	1192.4	378.4
10.01 - 12.50	183.98	142.47	-41.51	--	--	--	61.09	59.34	- 1.75	536.8	--	279.2
12.51 - 15.00	149.62	131.58	-18.04	131.41	71.38	-59.53	45.92	52.77	6.85	512.6	356.4	235.4
15.01 - 20.00	150.39	201.17	10.78	88.22	81.27	- 6.95	58.41	32.01	-26.40	754.6	475.2	211.2
20.01 - 25.00	--	--	--	84.31	119.31	35.00	57.85	85.65	27.80	--	642.4	415.8
Above 25.00	77.47	160.93	83.46	155.69	145.00	- 9.79	70.37	104.53	28.16	732.6	671.0	541.2
Total	183.06	157.21	-25.85	133.64	107.56	-26.08	71.04	61.34	- 9.70	662.2	563.2	283.8

4.10. Chillies.

Chillies is an important commercial crop raised in Stratum-1 and stratum-3. The total area under the crop forms 7.07% of the gross cropped area in S_1 and 2.19% in S_3 .

The total cost per acre of chillies is Rs.203.52 in stratum-1 as compared with Rs.174.08 in Stratum-3. The high total cost in S_1 is due to high costs of materials and bullock power which amounted to Rs.102.71 in S_1 and Rs.65.67 in S_3 .

The gross output per acre of chillies in S_1 has come to Rs.293.65 thus resulting in a net profit of Rs.90.13. But in S_3 the value of gross output is only Rs.110.22 thus involving a loss of Rs.63.86. However, the value of output net of hired human labour, materials, and bullock labour power has come to Rs.150.06 in S_1 and Rs.21.27 in S_3 .

The overall yield per acre of chillies has come to 314.4 lbs. as compared to 127.6 lbs. in S_3 . The yield varied considerably as between the different size groups of holdings in both the strata, the range of variation being from 52.8 lbs. to 389.4 lbs. in S_1 and from 26.4 lbs. to 664.4 lbs. in S_3 .

The over-all human labour input per acre has come to 38.59 mandays per acre in S_1 as compared with 28.58 in S_3 . The bullock labour input, which is mainly owned ~~own~~ labour, has come to 5.07 and 6.92 pairdays per acre in S_1 and S_3 respectively.

Table No. 4.28.

Cost of cultivation of Chillies per acre.

Item: (1)	Stratum-1		Stratum-3.	
	Cost (2)	% to Total (3)	Cost (4)	% to Total (5)
<u>1. Human labour</u>				
a. Family labour	16.67	8.20	16.99	9.76
b. Hired labour	31.88	15.66	23.28	13.37
	48.55	23.86	40.27	23.13
<u>2. Cost of materials.</u>				
<u>Fuel and power.</u>				
Seed	12.97	6.37	19.12	10.98
Manures & fertilisers	66.68	32.76	18.94	10.88
Hire charges for implements	0.37	0.18	0.23	0.13
Bullock labour	22.69	11.15	27.36	15.72
Pesticides	--	--	--	--
Fuel	--	--	--	--
Interest on crop loan	--	--	0.02	0.02
	102.71	50.46	65.67	37.73
<u>3. Interest and Rent.</u>				
Rental value or Rent	39.95	19.63	60.95	35.01
Interest on capital	1.36	0.67	0.48	0.28
<u>4. Land Revenue and Cesses</u>				
	5.39	2.65	4.39	2.52
<u>5. Depreciation on capital</u>				
	5.56	2.73	2.32	1.33
Total	203.52	100.00	174.08	100.00

Table No. 4.29.

Human labour per acre (8 hr. mandays)

Size group (in acres)	Stratum-1			Stratum-3		
	Family labour	Hired Labour	Total	Family Labour	Hired Labour	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.01 - 1.00	79.70	9.40	89.10	--	--	--
1.01 - 2.50	114.94	4.17	119.11	9.25	11.00	20.25
2.51 - 5.00	39.63	28.39	68.02	6.51	10.68	17.19
5.01 - 7.50	13.43	21.05	34.48	30.12	18.08	48.20
7.51 - 10.00	22.43	45.46	67.89	6.01	20.96	26.97
10.01 - 12.50	22.14	11.16	33.30	4.28	18.68	22.97
12.51 - 15.00	25.18	28.09	53.90	14.30	79.99	94.12
15.01 - 20.00	7.67	27.97	35.64	5.01	24.45	29.46
20.01 - 25.00	10.72	20.67	31.39	8.09	14.83	22.92
Above 25.00	2.18	31.23	33.41	1.84	24.89	26.73
Total	9.79	28.80	38.59	7.93	20.60	28.53

Table No. 4.30

Bullock labour per acre (8 hr. pair days)

Size group (in acres)	Stratum-1			Stratum-3		
	Owned	Hired	Total	Owned	Hired	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.01 - 1.00	0.30	5.65	5.95	--	--	--
1.01 - 2.50	--	4.17	4.17	--	7.00	7.00
2.51 - 5.00	0.57	8.98	9.55	3.63	1.06	4.69
5.01 - 7.50	0.90	3.59	4.49	7.24	5.23	12.47
7.51 - 10.00	5.62	0.95	6.57	3.58	3.00	6.58
10.01 - 12.50	1.75	--	1.75	6.97	--	6.97
12.51 - 15.00	5.64	--	5.64	18.66	--	18.66
15.01 - 20.00	2.30	1.34	3.64	4.49	--	4.49
20.01 - 25.00	4.41	--	4.41	6.00	--	6.00
Above 25.00	6.13	--	6.13	7.26	--	7.26
Total	4.24	0.83	5.07	5.67	1.23	6.92

Table No. 4.31.

The cost and output per acre (in Rupees)

Size Group (in acres)	Stratum-1			Stratum-3			Yield per acre (in lbs.)	
	Total Cost	Output	Profit or Loss	Total Cost	Output	Profit or Loss	S ₁	S ₃
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0.01 - 1.00	399.41	148.21	-251.20	---	---	---	99.90	---
1.01 - 2.50	433.09	277.78	-155.31	213.65	63.00	-150.65	200.2	74.8
2.51 - 5.00	509.74	293.64	-216.10	191.12	178.00	-13.12	336.6	217.8
5.01 - 7.50	163.82	125.57	-38.25	237.70	73.76	-168.94	140.8	85.8
7.51 - 10.00	284.27	334.90	50.63	138.95	157.88	+18.93	382.8	193.6
10.01 - 12.50	258.10	168.80	-93.30	145.38	106.32	-39.06	171.6	94.6
12.51 - 15.00	250.72	56.67	-194.05	287.70	550.13	+262.43	52.8	664.4
15.01 - 20.00	161.24	293.81	132.57	175.06	117.86	-57.25	321.2	94.6
20.01 - 25.00	171.48	229.73	58.25	196.12	110.90	-85.22	202.4	136.4
Above 25.00	206.80	259.37	152.57	150.25	21.05	-129.20	389.4	26.4
<i>Total</i>	203.52	293.65	90.13	174.08	110.22	-63.86	314.4	127.6

4.11 Groundnut.

Groundnut is another important commercial crop raised in all the three strata. The area under the crop forms 3.90 per cent of the gross cropped area in S_1 , 6.47% in S_2 and 3.77% in S_3 . However, it is also raised as a mixed crop generally with redgram.

The total cost of cultivation per acre has come to Rs. 126.13 in S_1 , Rs. 133.71 in S_2 and Rs. 127.09 in S_3 . Thus there is no appreciable difference in the total cost, in the three strata. Cost of human labour amounted to Rs. 32.52 in S_1 , Rs. 32.22 in S_2 and Rs. 26.69 in S_3 .

The gross output per acre of groundnut has come to Rs. 119.61 in S_1 , Rs. 110.90 in S_2 and Rs. 81.26 in S_3 . Thus there is an ^{overall net} ~~net~~ ^{loss} of Rs. 3.50 in S_1 , Rs. 22.81 in S_2 and Rs. 45.83 in S_3 . However the value of output net of cost of materials, bullock power and hired human labour has come to Rs. 48.24 in S_1 , Rs. 35.67 in S_2 ^{and} only Rs. 1.18 in S_3 .

The overall yield per acre in S_1 has come to 535 lbs. as compared with ~~423.8~~ ^{423.8} lbs. in S_2 and 365.2 lbs. in S_3 . The yield varied considerably as between the different size groups of holdings, the variation ^{being} from 334.4 lbs. to 1075.8 lbs. in S_1 , from 332.2 lbs. to 477.4 lbs. in S_2 and from 198.0 lbs. to 521.4 lbs. in S_3 .

The overall human labour input per acre has come to 32.95 mandays in S_1 as compared to 25.40 in S_2 and 21.29 in S_3 . Hired labour forms substantial portion of the human labour input in all the

three strata. The bullock labour input per acre has come to 2.65 pairdays in S_1 , 3.96 pairdays in S_2 and 5.65 pairdays in S_3 .

Table 4.32

Cost of cultivation of groundnut per acre

	S_1		S_2		S_3	
	Cost (Rs)	% to total	Cost (Rs)	% to total	Cost (Rs)	% to total
1. Human labor :						
Family labor	8.24	6.53	13.69	10.24	12.72	10.01
Hired labor	24.28	19.25	18.53	14.86	13.97	10.99
	32.52	25.78	32.22	24.10	26.69	21.00
2. Cost of material : Fuel and Power :						
Seed :	28.01	22.22	22.56	16.87	29.31	23.06
Manures & Fertiliser :	6.60	5.23	13.48	10.08	15.30	12.04
Bullock labour :	12.20	9.67	20.52	15.35	20.99	16.52
Hire charges for implement :	0.30	0.24	0.03	0.01	0.04	0.03
Pesticides	-	-	-	-	-	-
Fuel :	-	-	-	-	-	-
Interest on Crop loan	-	-	0.11	0.09	0.47	0.37
	47.11	37.36	56.70	42.40	66.11	52.02
3. Interest and Ren. :						
Rental value or Rent	40.27	31.93	39.18	29.30	29.68	23.36
Interest on capital	0.99	0.78	0.41	0.31	0.36	0.28
4. Land Revenue and Cesses :						
	2.93	2.32	2.97	2.18	2.25	1.77
5. Depreciation on capital :						
	2.31	1.83	2.29	1.71	2.00	1.57
Total	126.13	100.00	133.71	100.00	127.09	100.00

Table 4.33

Human labour per acre (in 8 hr. Mandays)

Size group (in acres)	Stratum-1			Stratum-2			Stratum-3		
	Family labour	Hired labour	Total	Family labour	Hired labour	Total	Family labour	Hired labour	Total
0.01 - 1.00	-	-	-	10.30	17.40	27.70	12.75	8.00	20.75
1.01 - 2.50	19.31	22.29	41.90	16.90	24.85	41.75	33.06	7.34	40.40
2.51 - 5.00	4.58	23.83	28.41	4.77	12.98	17.75	15.75	3.64	19.37
5.01 - 7.50	11.84	22.54	34.38	16.57	15.37	31.94	19.46	-	19.46
7.51 - 10.00	9.27	28.53	37.80	9.28	18.52	27.80	6.41	9.81	16.22
10.01 - 12.50	7.65	33.00	40.65	5.69	8.18	13.87	6.07	7.02	13.09
12.51 - 15.00	9.98	52.29	62.27	12.31	15.23	27.54	4.16	16.09	20.25
16.01 - 20.00	4.29	25.41	29.70	8.24	8.73	16.97	5.10	15.02	20.12
20.01 - 25.00	3.61	20.87	24.48	7.02	24.21	31.23	2.91	9.68	12.59
Above 25.00	2.47	24.80	27.27	4.21	26.33	30.54	2.93	34.94	37.91
Total	5.94	27.01	32.95	9.10	16.30	25.40	7.59	13.70	21.29

Table 4.34

Bullock labour per acre (8 hr. pairdays)

Size group (in acres)	<u>Stratum-1</u>			<u>Stratum-2</u>			<u>Stratum-3</u>		
	Owned	Hired	Total	Owned	Hired	Total	Owned	Hired	Total
0.01 - 1.00	-	-	-	-	4.30	4.30	5.00	-	5.00
1.01 - 2.50	0.38	1.33	1.71	-	2.00	2.00	5.88	3.13	9.01
2.51 - 5.00	-	1.67	1.67	1.30	-	1.30	5.64	-	5.64
5.01 - 7.50	1.32	1.20	2.52	5.31	-	5.31	5.95	-	5.95
7.51 -10.00	2.53	0.77	3.30	4.74	0.02	4.76	3.68	-	3.68
10.01 -12.50	2.87	-	2.87	3.28	-	3.28	3.42	-	3.42
12.51 -15.00	2.25	-	2.25	2.94	-	2.94	3.81	-	3.81
15.01 -20.00	2.64	-	2.64	5.10	-	5.10	3.75	-	3.75
20.01 -25.00	2.15	-	2.15	3.61	0.02	3.63	1.21	3.14	4.35
Above 25.00	2.99	-	2.99	3.92	-	3.92	11.73	0.47	5.65
Total	2.36	0.29	2.65	3.88	0.08	3.96	5.18	0.47	5.65

Table 4.35

Total cost and output per acre (in Rupees)

Size group (in acres)	Total cost	<u>Stratum-1</u>		Total cost	<u>Stratum-2</u>		Total cost	<u>Stratum-3</u>	
		Output	Profit or Loss		Output	Profit or Loss		Output	Profit or Loss
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
0.01 - 1.00	-	-	-	185.38	109.33	-76.05	151.00	80.00	-71.00
1.01 - 2.50	139.10	99.39	-49.71	135.64	102.00	-33.64	170.91	111.00	-59.91
2.51 - 5.00	92.66	64.00	-28.66	166.05	130.44	-35.61	165.54	66.92	-98.62
5.01 - 7.50	147.16	128.61	-18.55	143.60	104.24	-39.36	127.39	100.80	-26.59
7.51 -10.00	140.57	104.45	-36.12	127.25	107.47	-19.78	124.02	71.45	-52.57
10.01 -12.50	137.12	233.00	100.88	114.28	102.49	-11.79	62.22	66.69	4.47
12.51 -15.00	168.45	196.96	28.51	141.90	102.49	-39.41	111.96	70.50	-41.46
15.01 -20.00	133.45	155.09	21.64	138.04	114.74	-23.30	83.44	48.46	-34.98
20.01 -25.00	97.82	81.47	-16.35	126.43	128.70	2.27	72.25	129.09	56.84
Above 25.00	114.15	102.16	-11.99	170.30	98.66	-71.64	249.56	100.67	-148.89
Total	126.13	119.63	-6.50	133.71	110.90	-22.81	127.09	81.26	-45.83

(Contd.)

Table No. 4.35 (Contd.)

Yield (in lbs.)

Size-Group (in acres)	S ₁	S ₂	S ₃
(1)	(11)	(12)	(13)
0.01 - 1.00	--	442.2	332.2
1.01 - 2.50	422.4	413.6	415.8
2.50 - 5.00	334.4	358.6	255.2
5.01 - 7.50	528.0	387.2	382.8
7.51 - 10.00	420.2	391.6	336.6
10.01 - 12.50	1075.8	338.8	275.0
12.51 - 15.00	847.0	466.4	343.2
15.01 - 20.00	741.4	420.2	198.0
20.01 - 25.00	360.8	477.4	521.4
Above 25.00	468.6	332.2	519.2
Total	535.0	423.8	365.2

4.12. Virginia tobacco.

Virginia tobacco is the most important of the commercial crops raised in stratum-1. The area under the crop constitutes 11.24% of the gross cropped area in the stratum.

The total cost of cultivation of Virginia tobacco per acre has come to Rs.459.55 of which human labour amounted to Rs.97.29 and cost of materials and bullock power to Rs.214.65. The gross output per acre has come to Rs.614.89. Thus there is an overall net profit of Rs.155.34 per acre. The gross output net cost of materials, bullock power and hired human labour amounted to Rs.327.48. One interesting feature of this crop is that the cultivators incur losses very rarely. There is loss only in the third size group. In all the other size groups of holdings, there has been profit.

The overall yield per acre has come to 659.2 lbs. the range of variation between different size groups of holdings being from 281.6 lbs. to 946.0 lbs.

The overall human labour input per acre has come to 73.96 mandays of which family labour amounted to ~~only~~ 20.30 mandays. Thus more than two-thirds of the human labour has been hired labour. It can be seen from the table that in the cultivation of virginia tobacco, hired human labour was used in large quantities in all the size groups of holdings.

The overall bullock labour input has come to 10.68 pair-days per acre, 88% of which has been owned bullock labour.

Table No. 4.36.

Cost of cultivation of Virginia tobacco
per acre

Item.	Stratum - 1.	
	Cost (Rs.)	% to total
(1)	(2)	(3)
<u>1. Human labour.</u>		
a. Family labour	24.53	5.34
b. hired labour	72.76	15.83
	97.29	21.17
<u>2. Cost of materials.</u>		
<u>Fuel and Power.</u>		
Seed	25.16	5.47
Manures and fertilisers	66.43	14.46
Bullock labour	44.10	8.59
Hire charges for implements	12.14	2.64
Pesticides	--	--
Fuel	66.82	14.54
Interest on crop loan	--	--
	214.65	45.70
<u>3. Interest and Rent.</u>		
Rental value or Rent	110.48	24.04
Interest on capital	6.93	1.52
4. Land ^{Revenue} & Cesses	5.67	1.23
5. Depreciation on capital	24.55	5.34
Total.	459.55	100.00

Table No. 4.37

Human labour per acre (8 hr. mandays.)

Size group (in acres)	Stratum - 1.		
	Family labour	Hired Labour	Total
(1)	(2)	(3)	(4)
0.01 - 1.00	--	--	--
1.01 - 2.50	21.55	37.35	58.90
2.51 - 5.00	17.86	57.47	75.33
5.01 - 7.50	16.14	54.76	70.90
7.51 - 10.00	20.06	73.62	93.68
10.01 - 12.50	20.20	56.96	77.16
12.51 - 15.00	41.36	56.77	98.13
15.00 - 20.00	13.64	34.49	48.13
20.01 - 25.00	--	--	--
Above 25.00	9.93	51.12	61.05
Total	20.30	53.66	73.96

Table No. 4.38.

Bullock labour per acre (8 hr. pairdays)

Size group (in acres)	Stratum - 1.		
	Owned	Hired	Total
(1)	(2)	(3)	(4)
0.01 - 1.00	--	--	--
1.01 - 2.50	1.88	10.09	11.97
2.51 - 5.00	4.17	2.72	6.89
5.01 - 7.50	2.80	5.43	8.23
7.51 - 10.00	13.57	--	13.51
10.01 - 12.50	12.51	--	12.51
12.51 - 15.00	9.98	0.37	10.35
15.01 - 20.00	10.26	0.48	10.74
20.01 - 25.00	--	--	--
Above 25.00	7.29	--	7.29
Total	9.43	1.25	10.68

Table No. 4.39.

Total cost and output per acre (in Rs.)

Stratum Group (in acres)	Stratum - 1.			Yield per acre (in lbs.)
	Total Cost	Output	Profit	
0.01 - 1.00				
1.01 - 2.50	459.91	530.72	70.81	501.6
2.51 - 5.00	404.67	391.35	-13.32	281.6
5.01 - 7.50	408.66	474.94	66.28	519.2
7.51 - 10.00	532.80	756.00	223.20	882.2
10.01 - 12.50	478.98	522.74	43.76	431.2
12.51 - 15.00	466.14	643.54	177.40	558.8
15.01 - 20.00	500.20	785.63	285.43	946.0
20.01 - 25.00	--	--	--	--
Above 25.00	299.46	375.90	76.44	475.2
Total	459.55	614.89	155.34	659.2

4.13. Country tobacco.

Of the 140 selected cultivators in stratum-1, only 21 are raising country tobacco. The area under the crop forms 4.4% of the total cropped area in the stratum.

The total cost of cultivation of country tobacco per acre has come to Rs.194.65. Human labour accounted for Rs.48.53 and the cost of materials and bullock power to Rs.76.62. The other important component of cost is rent and rental value which accounted for nearly 30% of the total cost.

The estimated gross output per acre has come to Rs.260.79, thus there is a net profit of Rs.66.14 per acre. While the cost per acre is lower in the higher size groups as compared to the lower size groups, the same cannot be said in regard to output or profit. The gross output net of hired human labour, cost of materials and bullock power, has come to Rs.163.03. The overall yield per acre has come to 414.6 lbs, the range of variation in the size groups of holdings being from 257.4 lbs to 655.6 lbs.

The overall human labour input per acre has come to 28.42 mandays. Nearly 50 per cent of this has been hired human labour. The overall bullock labour input per acre has come to 7.02 pairdays, of which owned bullock labour formed 76 per cent.

Table No. 4.40

Cost of cultivation of country tobacco (in Rs.)

Item	Stratum - 1.	
	Cost(Rs.)	% to total
	(1)	(3)
<u>1. Human labour.</u>		
a. Family labour	27.39	14.07
b. Hired labour	21.14	10.86
	48.53	24.93
<u>2. Cost of materials,</u>		
<u>Fuel and Power.</u>		
Seed	17.28	8.88
Manures and fertilisers	30.90	15.87
Bullock labour	26.77	13.75
Hire charges for implements	1.67	0.86
Pesticides	--	--
Fuel	--	--
Interest on crop loans	--	--
	76.62	39.36
<u>3. Interest and rent.</u>		
Rental value or rent	57.84	29.71
Interest on capital	0.81	0.42
<u>4. Land revenue & cesses</u>		
	4.18	2.15
<u>5. Depreciation on capital</u>		
	6.67	3.43
Total	194.65	100.00

Table No. 4.41.

Human labour per acre (8 hr. mandays)

Size group (in acres)	Stratum - 1.		
	Family labour	Hired Labour	Total
(1)	(2)	(3)	(6)
0.01 - 1.00	33.36	20.80	54.16
1.01 - 2.50	--	--	--
2.51 - 5.00	20.38	22.68	43.06
5.01 - 7.50	15.77	2.81	18.58
7.51 - 10.00	17.75	13.02	30.77
10.01 - 12.50	31.48	--	31.48
12.51 - 15.00	19.77	59.22	78.99
15.01 - 20.00	7.47	16.38	23.85
20.01 - 25.00	21.84	1.75	23.59
Above 25.00	7.81	22.06	29.87
Total	13.69	14.73	28.42

Table No. 4.42.

Bullock labour per acre (8 hr. pairdays)

Size group (in acres)	Stratum - 1.		
	Owned	Hired	Total
0.01 - 1.00	--	8.16	8.16
1.01 - 2.50	--	--	--
2.51 - 5.00	0.15	7.87	8.02
5.01 - 7.50	--	1.55	1.55
7.51 - 10.00	5.21	1.46	6.67
10.01 - 12.50	6.13	--	6.13
12.51 - 15.00	6.28	--	6.28
15.01 - 20.00	4.63	2.34	6.97
20.01 - 25.00	5.00	--	5.00
Above 25.00	7.91	0.12	8.03
Total	5.37	1.65	7.02

Table No. 4.43.

Total cost and output per acre (in Rs.)

Size group (in acres)	Stratum-1			Yield per acre (in t/d)
	Total cost	Output	Profit or Loss	
0.01 - 1.00	239.60	405.33	165.73	371.8
1.01 - 2.50	---	---	---	---
2.51 - 5.00	264.11	231.39	-32.72	393.8
5.01 - 7.50	184.46	143.24	-41.22	257.4
7.51 - 10.00	192.98	281.22	88.24	655.6
10.01 - 12.50	235.59	112.50	-123.09	299.2
12.51 - 15.00	261.79	231.80	-29.99	400.4
15.01 - 20.00	155.73	186.42	30.69	360.8
20.01 - 25.00	153.13	155.00	1.87	299.2
Above 25.00	190.13	340.25	150.12	336.6
Total	194.65	260.79	66.14	414.6

4. 14. Non-Farm Enterprises.

The relative importance of the various non-farm activities in the rural area of Nagarjuna Sagar Project, both from the point of view of the number of households engaged in the enterprises and from the point of view of their contribution to the total income of the region have already been explained in ~~the previous~~ chapter II. Some of the more important of these activities or enterprises have also been selected for the purpose of making detailed input-output studies, of the 12 activities or enterprises selected for the purpose, 10 are secondary enterprises, the most important of them being weaving, tailoring, cobblery and Rice Mills. The two tertiary activities selected are transport and laundry services.¹

All the secondary enterprises with the exception of rice mills are found to be household enterprises, the work place or the place of operations being the residential house and the employment of hired labour also being small in these cases. No attempt has therefore been made to evaluate fixed capital in the form of land and buildings invested in the enterprises and no estimate of interest cost on fixed capital has been made. The present value of tools and implements used in the enterprises is however estimated for the purpose of calculating depreciation of the kind of capital as a cost. We have considered that 5% depreciation allowance is most reasonable under the conditions in which the enterprises are working.

1. Primary enterprises other than cultivation of land such as dairying, rearing of sheep and goats, rearing of pigs and poultry keeping are also important enterprises in the Project area. It is however found that dairying is rarely carried on as an independent enterprise and is in most cases, associated with cultivation of land. A detailed account of input-output relation in dairying is already included in the studies of Farm Enterprises. Hence this is not selected for study as a non-farm enterprise. The other primary enterprises were not selected for detailed input-output study because of certain inherent limitations of such studies under the conditions prevailing in the rural areas in India.

It is also necessary to point out here that no attempt has been made to evaluate family labour employed in the enterprises, and the labour cost estimated therefore constitutes the wage bill for hired labour only. The major item of cost of production estimated has thus come to be the cost of material inputs only. The type of income estimated is accordingly

i) Net income received after deducting, from the gross value of production, cost of material inputs, wages paid for hired labour, maintenance and repair of capital and depreciation. All these details are given in the ~~following~~ table No 4.44.

Weaving:- Out of the 45 sample households engaged in weaving, it is found that the value of fixed capital came to Rs.93.11 per household. This is the value of looms, spindles and other tools used in the enterprises and does not include the value of land and buildings. Family members supply the bulk of labour used in the enterprise. It is found that only 2 households are ~~are~~ employing hired labour. The expenses of Weavers consist ~~of~~ mainly of the outlay on yarn, dyes and chemicals and maintenance cost of tools and implements. The total cost per household amounting to Rs.405.48. The important types of clothing commodities produced by Weavers are saris, dhoties and towels. The net income received during the year in this enterprise has amounted to Rs.172.45 per household. It is however to be noted in this connection that only 3 households are solely dependent on weaving as an occupation. Among others, 23 households are having this only as a subsidiary occupation. The amount of net income received from other sources is in fact nearly twice the income received from weaving, amounting to Rs.306.3. Most of the households derive considerable amount of income from cultivation and agricultural casual labour.

It may be relevant here to make a reference to the fact that a high proportion of the sample households do business on a purely contractual basis, for instance 18 out of the 45

households are doing business exclusively on a contractual basis. 21 households are doing business exclusively on a commercial basis and 6 households combine both types of business.

The difference between the contractual type and commercial type ^{of business is that in the case of the commercial type,} the weavers depend on their own resources for purchase of raw materials, production and marketing. If they are working under contracts, they will be mainly supplying labour and receiving wages in return.

Ambercharka: This enterprise is found to be mostly localised in two villages in Stratum-1. Out of the total number of 18 households have ^{ing} Ambercharka spinning as an occupation in these villages, 17 are found to be located in one village namely Madala. A sample of 5 households is drawn for the purpose of Input-output study, but it is found that 2 out ^{of} the 5 households, are not using Ambercharka. These Ambercharkas are supplied by the Government in 1958 at a price of Rs. 120/- each. It is ~~very~~ interesting to note here that only women workers are engaged in working on the Ambercharka. The working expenses in this enterprise consist mainly of outlay on cotton which come to only Rs. 5/- per household, the total cost per household amounting to Rs. 15.19. The value of the gross production came to Rs. 14.3 per household and net ^{loss of} Rs. 0.85. It is generally felt that this enterprise is not at all a remunerative one.

Tailoring: Tailoring is an important enterprise in the project area and it is found that 172 households are engaged in this in the sampled villages. A sample of 15 households was taken for the purpose of this study and 14 of them were finally studied. Tailoring is not only essentially a household occupation, but it is also a men's occupation. Out of the 17 persons employed in these 14 household enterprises, 16 are men workers and 1 is a male child worker. Employment of hired labour is not a feature of this enterprise. It may

also be pointed out that the work of tailoring is a skilled one and it is also of purely contractual type.

The value of sewing machine and other tools came to Rs. 228.1 per household, which is a little less than the current market value of the sewing machine. The cost of material inputs is the most important of the cost and the cost of maintenance and repairs comes next in order of importance, the total cost amounting to Rs. 56.46 per household. The gross value of production come to Rs. 278.63 per household and net income to Rs. 222.17. As in the case of all other rural occupations, the tailoring households also have other sources of income. In fact, the majority of ^{them}, 8 out of 14, have tailoring only as a subsidiary occupation, cultivation of land and agricultural casual labour are two of the most important other occupations of these households, the net income from other sources amounting to Rs. 353.2 per household.

Cobbler: Cobbler is an important enterprise widely practised by the Harijan Caste in the Project Area, particularly from the point of view the number of households engaged in this enterprise. It is found that 485 households are engaged in ~~cobbler~~ cobbler in the sampled villages. A sample of 22 households has been selected and studied. This occupation like tailoring is also essentially a men's occupation, and hired labour is not used in the enterprise. The value of tools and implements used in the enterprise is estimated to be only Rs. 4.23 per household and this is therefore one of the rural enterprises requiring little capital investment. The working expenses of the households consist mainly of expenditure on leather which forms about 70% of the gross value of output. The total cost of production has amounted to Rs. 66.86 per household, while the gross value of production amounted to Rs. 89.66 per household. Net income per household thus comes to a small amount of Rs. 22.8 only. These households, however receive considerable amount

of income from other occupations amounting Rs.291.30 per household. The most important of other occupations are agricultural casual labour, and cultivation of land.

Goldsmithy: It is found that there are 43 households of goldsmiths in all the sample villages put together. A sample of 10 of these households was taken for study and 9 of them were studied. The work of goldsmiths is essentially skilled work and is undertaken ^{on} a contractual basis. It is also completely a men's job. The survey of the households shows that the value of capital invested in tools and implements has come to Rs.57.53 per household. The main items of cost for the goldsmiths is the cost of charcoal and chemicals needed for the processing of silver and gold. The total cost per household is estimated at Rs.44.44 and the gross value of production at Rs.259.11. The net income thus amounts to Rs.214.67 per household. The chief other occupation of the goldsmith household is cultivation of land, The net income received from other occupations has amounted to Rs.371.00 per household.

Basket making: The total number of households engaged in basket making in sample villages came to 120 and a sample of 15 households was taken for study and 14 households were actually studied. This is an occupation undertaken almost exclusively by one caste by name Erukulas. Both men and women workers of the families, devote their labour to basket making. The art of basket making may be considered a skilled one but the incomes earned by the basket makers rarely represent returns to skilled labour as in the case of weavers, or tailors or goldsmiths. The value of implements used in this enterprise is pretty small and does not exceed Rs.4/- per household and in this respect the enterprise is similar to cobblery. The cost of material inputs in the enterprise (value of bamboo and canes of suitable trees purchased as raw materials) is most important

of the cost items and constitutes more than 90% of the total cost of production and nearly 25% of gross value of production. The gross value of production is estimated at Rs. 171.10 per household and the net income at Rs. 119.01 per household. The basket making households also receive considerable income from other occupations like cultivation, casual labour and from rearing of Pigs, amounting Rs. 166.98 per household.

Pottery: The number of pottery households in the sample villages is the same as the number of basket making households (120). A sample of 16 households was taken for study and 14 households were actually studied. Pottery is an occupation in which men, women and children of the family work and no hired labour is employed. The art of making pots of clay may be considered a skilled art but as in the case of basket makers, the returns which potters receive for their labour are rarely high. A peculiar feature of this household occupation is that ~~by~~ the female workers specialize in selling the product while the men workers specialize in the processing of clay.

The turning wheel of potters is the most important implement of the enterprise. The value of capital invested in the form of tools and implements is estimated at Rs. 30.35 per household. As in the case of basket making, the cost of material inputs consisting mainly of outlay on clay and fuel constitutes more than 90% of the total cost and nearly 20% of the gross value of production. The gross value of production per household comes to Rs. 146.79 and net income to Rs. 104.63. Here again, as in the case of other enterprises the majority of households have other occupations like agricultural casual labour and cultivation, the net income from which amounts to Rs. 289.00 per household.

Blacksmithy: Generally one or two households of blacksmiths will be found in each village. Of 37 households of blacksmiths situated in the sample villages, a sample of 18 was taken

and 16 households were studied. The occupation of blacksmiths like that of goldsmiths, is exclusively a men's occupation. In a few cases, hired labour is sometimes employed to assist the men workers. The art of blacksmithy is a skilled one and the earnings of blacksmiths are reasonably high and it is mainly a contractual type of work.

The value of investment in implements and tools is estimated at Rs. 169.17 per household, the important tools of blacksmiths being the blow-pipe and the hammer. The working expenses in the enterprise consist mainly of outlay on fuel and maintenance and repairs and wages for hired labour. The total cost is estimated at Rs. 37.76 per household while the gross value of production is estimated at Rs. 410.88 per household. The net income received is thus Rs. 379.27 per household and it is considerably higher than the net income received from other sources. The chief other occupations of blacksmith households are cultivation and agricultural casual labour, the net income from such sources amounting to Rs. 207.16 per household.

Carpentry:-

It is found that there are more households of carpenters than either of goldsmiths or blacksmiths in sample~~d~~ villages. Out of the total number of 150 households enumerated in the sample~~d~~ village, a sample of 34 households was taken for study and the actual number of households studied was 28. This occupation is also essentially a men's occupation requiring skill and is also mainly a contractual type of work. Although this is a household occupation,

considerable amount of hired labour is employed in this enterprise. In fact, it is found, that wages paid for hired labour constitute the most important item of working expenses. The value of tools and implements used in the enterprise ^a come to Rs. 84.16 per household. The total cost per household is estimated at Rs. 55.89 and the gross value of production at Rs. 481.16. The net income amounts thus to Rs. 425.27 per household, the amount being highest in comparison with all the selected enterprises for the study. The principal other occupations of carpenter households are cultivation, agricultural labour and blacksmithy, the net income from these sources amounting to Rs. 193.04 per household.

Transport:-

The means of transport available in sampled villages, other than the double bullock cart available with the farmers, are the single bullock cart, the horse-drawn vehicle and the rickshaw. A sample of 10 households having such means of transport was taken and studied. This occupation is also purely men's occupation, and the ratio of family workers to the vehicles is generally 1:1 and no hired labour is employed. The value of capital invested in the means of transport is estimated at Rs. 281.85 per household and this is ^{the} highest figure for the enterprises selected for study, with the exception of rice mills. The working expenses in the enterprise consist mainly of the maintenance of the animals and vehicles and constitute the most important item of cost. The gross value of production from the enterprise is estimated at Rs. 744.0 per household and the total cost at Rs. 340.06. The net earnings

2) The study of transport enterprise is subject to some limitation because the sample includes animal-driven carts and rickshaws and the rickshaws are owned by the households

thus amount to Rs.403.94 per household. The transport households have also other important occupations, the most important of which seems to be agricultural casual labour, the net income from such sources amounting to Rs.162.³⁰ per household.

Laundry:

Laundry is an important service in which a large number of households are engaged in the sampled villages. Out of the 410 households enumerated, a sample of 10 households is drawn for the study. Laundry service or washing of clothes is an essential service in all the villages. It is a family occupation in which men, women and children work. The Laundry households constitute by themselves a separate caste by name Rajakas and the service is rendered on a contractual basis, the payments for the laundry services being on a monthly or on an annual basis and are also made in kind. The capital investment in the enterprise does not exceed Rs.11 per household. The majority of households do not seem to have invested capital in the Ironing tools. The working expenses of households include mainly the cost of washing soda, bleaching powder, lime, starch, earthen pots etc., and constitute nearly 90% of the total cost. The gross value of production is estimated at Rs. 278.9 per household and the total cost at Rs. 30.15 per household. The net income received thus amounts to Rs. 248.75 per households. The chief other occupations of the laundry households are cultivation of land and agricultural casual labour, the net income from such sources being Rs.213.15 per household.

Rice Mills:

It is found that there are 7 households owning ricemills in the sample villages. An attempt was made to investigate all these 7 households but only 3 of them responded to our enquiry. This is the only enterprise which is regarded as either non-household enterprise, which makes use of power, the source being either diesel oil or electricity and hired labour plays an important part in ^{the} running of these mills. The value of capital invested in the mills is estimated at Rs.6442.25 per household. The total cost of operation is estimated at Rs. 1269.95 per household, of which depreciation on fixed capital constitutes the most important item. The gross value of production³ is estimated at Rs. 1382.00 per household, the net income, thus amounting to Rs. 112.05 per household. The comparatively low returns in this enterprise are to be attributed to the high capitalisation. The principal other occupations of these households are cultivation of land and retail trade, from which they receive net income amounting Rs.1299.00 per household.

³ The reported gross value of production in the case of this enterprise seems to be considerably an underestimate.

Input - Output Structure in Non-Farm Enterprises.

Name of enterprise	No. of h.h. sampled	No. of h.h. analysed	No. of family workers	No. of hired employees	Fixed Capital	Gross value of production.	Cost of material inputs	Wages paid for hired labour	Depreciation	Maintenance and repairs.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Weaving	48	45	111	4	4189.94	26007.00	17209.10	245.00	209.50	450.00
					(93.11)	(577.93)				
2. Ambercharka	5	3	3	-	360.00	43.00	15.56	--	18.00	12.00
					(120.00)	(14.33)				
3. Tailoring	15	14	17	-	3193.24	(278.63)	326.69	--	159.66	280.00
					(228.09)	3900.87				
4. Cobblery	22	22	23	-	93.15	1972.50	1400.18	--	4.66	66.00
					(4.23)	(89.66)				
5. Goldsmithy	10	9	9	-	517.79	2332.00	271.08	--	25.89	27.00
					(57.53)	(259.11)				
6. Basket making	15	14	27	-	47.74	2395.38	682.50	--	2.39	42.00
					(3.41)	(171.10)				
7. Pottery	16	14	43	-	424.86	2055.14	505.05	--	21.24	42.00
					(30.35)	(146.79)				
8. Blacksmithy	18	16	26	1	2706.75	6574.00	214.00	78.75	135.34	80.00
					(169.17)	(410.88)				
9. Carpentry	34	28	41	3	2356.36	13472.34	139.00	825.00	117.82	140.00
					(84.16)	(481.16)				
10. Transport	10	10	10	-	2818.50	7440.00	1241.25	--	140.93	200.00
					(281.85)	(744.00)				
11. Laundry	10	10	30	-	108.26	2789.00	266.13	--	5.41	30.00
					(10.83)	(278.90)				
12. Mills	7	3	4	5	19326.75	4146.00	952.50	1450.00	966.34	300.00
					(6442.25)	(1382.00)				

Table No. 4.4~~4~~ (contd.)Input - Output Structure in Non-Farm Enterprises (contd.)

Name of enterprise	Other payments	Total cost	Net income	Net income per h.h.	Net income from Other sources	Net Income from all sources per h.h.
	(12)	(13)	(14)	(15)	(16)	(17)
1. weaving	133.00	18246.60 (405.48)	7760.40	172.45	13781.83 (306.27)	478.72
2. Ambercharka	--	45.56 (15.19)	-2.56	-0.85	2890.00 (963.33)	962.48
3. Tailoring	24.12	790.47 (56.46)	3110.40	222.17	4945.00 (353.22)	575.39
4. Cobblery	--	1470.84 (66.86)	501.66	22.80	6408.50 (291.30)	314.10
5. Goldsmithy	76.00	399.97 (44.44)	1932.03	214.67	3339.00 (371.00)	585.67
6. Basket Making	2.33	729.22 (52.09)	1666.16	119.01	2337.75 (166.98)	285.99
7. Pottery	22.00	590.29 (42.16)	1464.85	104.63	4046.00 (289.00)	393.63
8. Blacksmithy	--	508.09 (37.76)	6065.91	379.12	3314.50 (207.16)	586.28
9. Carpentry	343.00	1564.82 (55.89)	11907.42	525.27	5405.50 (193.04)	618.31
10. Transport	1818.44	3400.62 (340.06)	4039.38	403.94	1623.00 (162.30)	566.24
11. Laundry	--	301.54 (30.15)	2487.46	248.75	2131.50 (213.15)	461.90
12. Mills	3809.84 141.00	3809.84 (1269.95)	336.16	112.05	3897.00 (1299.00)	1411.05

Note: Figures in brackets are averages per household.

h.h. = household.

CHAPTER V.

ESTIMATE OF THE AGRICULTURAL OUTPUT IN THE PROJECT AREA FOR
1959-60

5.1 General.

In order to estimate the benefits that are likely to arise from irrigation in the Nagarjunasagar Project area, it is first of all necessary to estimate the probable net increase in agricultural production over the existing level consequent on the provision of irrigation. The problems involved in making a reliable estimate of this quantity are several. We have to make estimates of the position at present in respect of the extent of cultivated area, intensity of cultivation, cropping pattern, crop yields, input requirements of crops, etc., and also changes in these respects after the Project area is brought under irrigation. The present and the following chapters are devoted to a detailed examination of these problems and estimates of net increase in the total agricultural product in the region. Reference will be made in a subsequent chapter to the indirect and other benefits from irrigation, ~~and probable~~ benefits from hydro-power generation, flood control and such other aspects of the Nagarjunasagar Project.

5.2 Cultivated area and Cropped area.

The Joint Report of the Andhra and Hyderabad States on the Mandikonda Project gives estimates of the gross and net commanded areas and the area proposed to be brought under irrigation under the Right Bank Canal and the Left Bank Canal of the Nagarjunasagar Project, but does not provide any information regarding the extent of area actually cultivated at present in the villages included in the proposed ayacut. It has also not been possible for us to get consolidated figures of cultivated area and cropped area in these villages, which are distributed over several

taluks and districts. These statistics should be available with the Revenue Department but are not published separately for the Project area. In the course of our investigations, we have, however, collected information regarding the cropping pattern in the villages included in the proposed ayacut to the extent it was available at the headquarters of the taluks. We could not unfortunately get uniform data about the cropping pattern for all the villages and for the year 1959-60. Hence, we could not rely on this information for estimating the extent of cultivated area. Statistics of cultivated area in the villages are also available in the 1951 census, published in the District Census Hand-books. These are however given as average extents for the 5-year period preceding the 1951 Census. The reliability of data, as given in the Hyderabad State Census, is also open to doubt. Further, there is no way of knowing the changes that might have taken place in the extent of the cultivated area subsequent to 1951. Accordingly, we have not made use of this information also for the purpose of estimating the cultivated area.

It is possible to make a reasonably dependable estimate of the extent of cultivated area and cropped area in the ayacut villages by making use of the data we have collected. One method of doing this is to first estimate the total number of households in the region and then multiply it by the average cultivated area per household as obtained from our Census Survey of the sampled villages.¹

1. In estimating the number of households existing in all the ayacut villages in 1959, we have taken the rate of growth of households in the sampled villages between 1951 and 1959 on the basis of 1951 Population Census and our ~~and 1959 census on the basis of 1951 Population Census Survey~~ in 1959 and applied this rate of growth to estimate the number of households in the non-sampled villages in 1959.

Another method of estimation is first to take the total cultivated area of the resident households in the sampled villages, ^{as obtained in our Census survey.} and then to blow up ^{the} totals by ^{reciprocals of} appropriate sampling fractions to arrive at the total cultivated area in the region. A third method consists in first taking the total cultivated area as reported by the village officers (and collected in our village schedules), and then blow ^{them} it up by ^{reciprocals of} appropriate sampling fractions to arrive at the total cultivated area in the region.

The estimates arrived at by following the various methods described above are given in the following table No. 5.1

Table No. 5.1

Estimate of cultivated area (in acres)

Method	Stratum 1	Stratum 2	Stratum 3	Total
1. As per information available at taluk headquarters (Cropped area)	6,75,091	6,12,212 (excluding villages in Darsi and Marapur taluk)	5,15,003 (excluding 3 villages in Suryapet taluk)	18,02,306
2. Based on 1951 Census	6,05,443.09	7,44,705.00	7,92,517.89	21,42,670.93
3. Based on Census Survey of sample villages and estimate of number of households	4,79,942.77	7,17,140.39	3,97,375.03	15,94,453.19
4. Based on ^{the} Census Survey of sample villages and estimate estimate of cultivated area of resident households, ^{obtained in our} obtained in our Census Survey	5,13,504.32	5,86,343.45	5,92,945.65	16,92,793.42
5. Based on cultivated area reported by village officers in sample villages	6,63,855.92	6,85,815.90	10,20,589.07	23,70,260.39

For the sake of comparability, all the 5 estimates given in the above table are made only for the villages included in the frame used for the purpose of sampling. As already explained, we have not accepted the estimates based on Methods 1 and 2. We have also not been able to accept the estimate based on Method 5, as the figures reported by the village officers are based on old settlement surveys for some villages and as information is not provided for some of the other villages. The reliability of information given for some of the un-surveyed villages under the old zamindari system is also open to doubt. We are thus led to choose between the two estimates based on Methods 3 and 4. The estimate based on Method 3 also appears to be defective as the estimate of total number of households in the non-sample villages for the year 1959-60 could not be obtained independently. We have, therefore, finally accepted the estimate based on Method 4. According to this method, the total extent of cultivated area is estimated at 5.14 lakh acres in Stratum-1, 5.86 lakhs in Stratum-2 and 5.93 lakhs acres in Stratum-3, giving a total acreage of 16.93 lakhs.

It is now necessary to make an estimate of the cultivated area of the villages in the proposed ayacut which are not included in the frame used for the purpose of sampling i.e. villages with more than 5,000 population, uninhabited villages and towns as per 1951 Population Census. The information we have collected at the headquarters of taluks in the Project area covers these areas also. The figures of cropped area available for these areas are corrected for intensity of cropping in order to obtain the cultivated area, the intensity of cropping obtained in our Farm Surveys being used for this purpose. The details of these calculations are presented in the following table No 5.2

Table No. 5.2

<u>Item</u>	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>
1. Intensity of cropping	1.04	0.93	1.11
2. Gross cropped area in towns (in acres)	33,334	15,127	2,090
3. Cultivated area in towns (in acres)	29,167	15,436	1,333
4. Gross cropped area in villages with population over 5,000 (in acres)	38,233	17,833	20,949
5. Cultivated area in villages with population over 5,000 (in acres)	36,811	13,202	13,872
6. Gross cropped area in un-inhabited villages	-	11,706	10,059
7. Cultivated area in un-inhabited villages	-	11,944	9,062
Total gross-cropped area	68,617	44,671	33,098
Total cultivated area	65,978	45,532	29,317

The final estimates of the total cultivated area and cropped area in the three strata may be now given as follows:

	<u>S₁</u>	<u>S₂</u>	<u>S₃</u>	<u>Total</u>
1. Cultivated area	5,79,432	6,31,925	6,22,763	18,34,170
2. Cropped area	6,02,661	6,19,237	6,91,267	19,13,215

5.3 Estimate of cropping pattern.

As stated above, the data we have collected from the headquarters of various taluks regarding the cropping pattern, ~~is~~^{are} not available for all the villages for the year 1959-60. The data collected do not also

give sufficient details regarding the cropping pattern, especially about the variety of mixed crops raised. The allocation of areas under mixed-cropping to individual crops as reported by the village officers and supplied to the headquarters of taluks may be also subject to considerable error. We have therefore attempted to estimate the cropping pattern based on the Farm Surveys we have conducted. For the purpose of our Farm Surveys, we have taken samples of cultivator households in each village.² ^{the} The final ~~weighted~~ crop pattern estimated for each of the strata is given in the following tables 5.3, 5.4 and 5.5.

Table No. 5.3

STRATUM-1Estimated Crop Pattern

Name of the crop	Weight % in total area	Area (in acres)
(1)	(2)	(3)
1. Irrigated Paddy	1.13	6810.07
2. Unirrigated Paddy	2.65	15970.52
3. Jowar	13.92	83390.41
4. Variga	22.09	133127.81
5. Bajra	3.00	13079.83
6. Korra	0.23	1637.45
7. Coriander	3.16	19044.09
8. Ragi	0.12	723.19
9. Chillies	4.60	27722.41
10. Groundnut	3.53	21575.26
11. Virginia tobacco	9.83	59542.91
12. Country tobacco	7.90	47610.22
13. Cotton	0.75	4519.96
14. Greengram	3.11	18742.76
15. Bengalgram	0.40	2410.64

(Contd.)

2. For details of sampling and estimation methods, see volume II.

STRATUM-1 Table No. 5.3 (Contd.)
Estimated Crop Pattern

Name of the crop (1)	Weights % in total area (2)	Area (in acres) (3)
16. Horsegram	0.03	180.80
17. Vegetables	0.65	3917.30
18. Fodders	0.39	5363.63
19. Miscellaneous	0.41	2470.91
20. Jowar + Redgran	15.53	93593.25
21. Jowar + Others	0.40	2410.64
22. Variga + Others	0.43	2591.44
23. Bajra + Castor	2.20	14 ³ 258.54
24. Bajra + Redgran	1.33	3015.39
25. Redgran + Unirrigated paddy	0.50	3013.31
26. Groundnut + Others	1.03	6207.41
27. Bajra + Cotton	0.03	180.30
Total	100.00	6,02,661.00

STRATUM-2 Table No. 5.4
Estimated Crop Pattern

Crop (1)	Weights % in total area (2)	Area (in acres) (3)
1. Irrigated paddy	1.07	6,626.37
2. Unirrigated paddy	0.35	2,167.50
3. Jowar	11.23	69,545.93
4. Variga	8.44	52,267.82
5. Bajra	2.36	14,615.17
6. Korra	0.57	3,529.94
7. Coriander	0.30	1,357.36
8. Ragi	2.01	12,447.67
9. Chillies	0.39	2,415.22

(Contd.)

Estimated Crop Pattern

Crop	Percentage % of total area	Area (in acres)
(1)	(2)	(3)
10. Groundnut	4.00	24,771.48
11. Virginia tobacco	1.33	8,236.52
12. Country tobacco	1.37	8,434.23
13. Cotton	1.47	9,103.52
14. Greengram	0.79	4,892.37
15. Bengalgram	0.26	1,610.15
16. Horsegram	0.23	1,734.00
17. Vegetables	0.09	557.36
18. Castor	2.41	14,924.82
19. Gingelly	0.19	1,176.65
20. Fodders	0.91	5,635.51
21. Arikalu	0.15	923.93
22. Jowar + Redgram	7.19	44,526.74
23. Jowar + Redgram etc.	5.77	35,732.86
24. Jowar + Greengram	2.22	13,743.17
25. Variga + Jowar	13.56	83,975.32
26. Bajra + Castor	0.64	3,963.44
27. Bajra + Redgram	4.63	28,672.99
28. Bajra + Redgram etc.	14.96	92,645.34
29. Bajra + Others	0.62	3,839.58
30. Korra + Jowar	0.62	3,939.58
31. Korra + Jowar etc.	1.80	11,147.17
32. Korra + Redgram etc.	2.81	17,401.96
33. Korra + Cotton	1.40	8,670.02
34. Korra + Castor	0.53	3,591.86
35. Coriander + Jowar	0.23	1,424.36
36. Groundnut + Redgram	1.46	9,041.59
37. Groundnut + Castor	0.29	1,795.93
38. Groundnut + Cotton	0.50	3,096.44
39. ^{Cotton} Other + Gingelly	0.75	4,644.63
Total	100.00	6,19,237.00

Table No. 5.5
STRATUM-3.
Estimated Crop Pattern

Name of the crop (1)	Weight % in total area (2)	Area (in acres) (3)
1. Irrigated Paddy	7.28	50,324.24
2. Jowar	23.16	1,94,660.79
3. Variga	2.55	17,627. ³ / ₁
4. Bajra	4.18	28,394.96
5. Korra	1.14	7,880.44
6. Chillies	3.97	27,443.30
7. Groundnut	3.27	22,604.43
8. Country tobacco	0.10	691.27
9. Cotton	0.22	1,520.79
10. Greengram	11.48	79,357.45
11. Bengalgram	0.65	4,493.24
12. Horsegram	1.41	9,746.86
13. Vegetables	0.08	553.02
14. Castor	0.38	2,626.81
15. Fodders	0.05	345.63
16. Jowar + Cucumber	17.60	1,21,662.99
17. Jowar + Redgram etc.	0.23	1,935.55
18. Jowar + Greengram	0.22	1,520.79
19. Jowar + greengram etc.	1.22	8,433.46
20. Bajra + Jowar	0.02	138.25
21. Bajra + Redgram	0.32	2,222.05
22. Bajra + Cotton	0.07	433.89
23. Korra + Redgram	0.36	2,438.56
24. Korra + Cotton	0.98	6,774.42
25. Groundnut + Redgram	12.04	83,228.55
26. Greengram + Redgram	1.84	12,719.31
27. Castor + Horsegram	0.11	760.39
28. Redgram + pillipesara	0.02	138.25
Total	100.00	6,91,267.00

It may be seen from the tables on cropping patterns that there is a great deal of diversification in crop production in all the three strata. In S_1 , the total number of crops raised is found to be 27 including 8 mixed crops. In S_2 , the number is found to be 39 which includes 13 mixed crops. In S_3 , the number is 23 which includes 13 mixed crops. The leading crops in S_1 , ~~in order of importance acreage under crops in S_1~~ , in order of importance of acreage under crops, are variga, jowar mixed with redgram or others, jowar as an unmixed crop, virginia tobacco, chillies, groundnut, pulses, coriander, bajra and un-irrigated paddy. In S_2 , the leading crops are variga mixed with jowar and unmixed, jowar mixed with redgram and others and unmixed, groundnut, korra mixed with redgram and unmixed, bajra, ragi, and castor. In S_3 , the leading crops, in order of importance, are jowar mixed with pulses and unmixed, greengram and other pulses, groundnut mixed with redgram and unmixed, irrigated paddy, bajra and chillies.

5.4 Crop yields, prices and gross output

The total agricultural output may be now estimated by taking into account the crop yields, prices and the value of the by-products. The data about crop yields and prices are obtained from the Farm Surveys we have conducted. The prices are average values arrived at by dividing the value of the produce by the crop yields. The details are given in the following tables Nos. 5.6 to 5.11.

Stratum - 1

Table No. 5.6

AVERAGE PRICES AT WHICH THE PRODUCT IS VALUED (1950-51)

Product (1)	Price per md. of 82 ² / ₇ lbs Rs. nP. (2)
1. Paddy (Irrigated) ...	12.52
2. Black Paddy ...	11.84
3. Jowar ...	14.84
4. Bajra ...	13.20
5. Korra ...	11.84
6. Variga ...	12.52
7. Redgram ...	12.32
8. Greengram ...	13.20
9. Horsegram ...	15.33
10. Bengalgram ...	15.06
11. Groundnut ...	17.40
12. Coriander ...	26.50
13. Chillies ...	76.68
14. Virginia tobacco ...	76.36
15. Country tobacco ...	50.52
16. Castor ...	11.46
17. Cotton ...	23.27
18. Ragi ...	10.58

Stratum - 2.

Table No. 5.7

Average Prices at which the Product is valued (1959-60)

Product Product (1)	Rs. per md. of 82 2/7 lbs. (2)
1. Paddy	13.77
2. Black Paddy	11.27
3. Jowar	13.23
4. Bajra	13.66
5. Korra	10.09
6. Variga	11.80
7. Redgram	12.67
8. Greengram	12.51
9. Horsegram	17.12
10. Bengalgram	18.28
11. Groundnut	19.83
12. Coriander	33.82
13. Chillies	61.55
14. Virginia Tobacco	87.14
15. Country Tobacco	23.36
16. Castor	15.92
17. Cotton	27.42
18. Ragi	13.40
19. Sannhemp	23.65
20. Vegetables	3.79
21. Gingelly.	30.94

BPR.

Stratum - 3:

Table No. 5.8

Average Prices at which the Product is valued (1959-60)

<i>Product</i>	Rs. per <i>mdm</i> of 82 2/7 lbs.
1. Paddy (Irrigated)	12.50
2. <i>Vegetable</i>	13.45
3. Jowar	12.76
4. Bajra	13.55
5. Korra	11.51
6. Variga	10.76
7. Redgram	14.23
8. Greengram	13.84
9. Horsegram	13.42
10. Bengalgram	14.81
11. Groundnut	17.85
12. Coriander	36.78
13. Chillies	69.49
14. Country Tobacco	36.68
15. Castor	13.16
16. Cotton	24.50

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Stratum - 1.

Table No. 5.9 .

Main Product value of main product and byproduct and
Total output per acre.

Crop	Extent in acres.	Yield in maunds	Value per acre (in Rs.)		
			Main product	Bypro- duct	Total output (4) + (5)
(1)	(2)	(3)	(4)	(5)	(6)
1. Irrigated paddy	9.95	21.24	265.92	37.24	303.16
2. Black paddy	18.71	6.18	73.17	21.16	94.33
3. Jowar	152.10	5.92	87.85	38.95	126.80
4. Variga	228.88	7.72	96.65	22.36	119.01
5. Bajra	29.67	3.71	49.31	8.32	57.63
6. Korra	8.50	1.99	23.56	7.18	30.74
7. Coriander	22.80	5.77	152.91	5.81	158.72
8. Ragi	1.01	8.34	88.24	27.45	115.69
9. Chillies	8 1/2 1.51	3 1/2 8.82	292.87	0.78	293.65
10. Groundnut	44.99	6.54	114.38	5.25	119.63
11. Virginia tobacco	129.66	8.01	611.64	3.25	614.89
12. Country tobacco	50.75	5.09	257.15	3.64	260.79
13. Cotton	31.65	1.72	48.62	--	48.62
14. Greengram	35.37	2.81	62.03	--	62.03
15. Bengalgram	3.90	2.89	43.52	--	43.52
16. Horsegram	0.49	4.00	61.32	--	61.32
17. Vegetables	5.30	35.66	100.56	--	100.56
18. Fodders	10.83	--	51.43	--	51.43
19. Miscellaneous	3.80	--	92.63	--	92.63
20. Jowar+red-gram	146.42	Jowar 4.28 Redgram 1.08	76.81	29.87	106.68
21. Jowar+others	4.10	Jowar 0.26 Coriander 0.73	20.20	58.85	79.05
22. Variga+Others	3.55	Variga 4.37 Coariander 0.04	55.77	11.27	67.04
23. Bajra+Castor	20.25	Bajra 2.22 Castor 0.16	31.34	9.21	40.55
24. Bajra+Red-gram	28.42	Bajra 1.01 Redgram 1.14	27.47	7.68	35.15
25. Redgram+Blackpaddy	3.90	Redgram 3.28 Blackpaddy 7.06	124.00	25.51	149.51
26. Groundnut+Others	11.25	Groundnut 5.96 Castor 0.23 Cotton 0.04 Redgram 0.61	115.52	8.18	123.70
27. Bajra+cotton	1.50	Bajra 3.01 Cotton 3.03	125.66	20.00	145.66

Main Product per acre, Value of main product, by product and total output per acre
(Value in Rs.)

Crop	Acreage	Yield per acre (in mds.)	Value of Main product per acre	Value per acre of by product.	Total output Col.(4)+ Col. (5)
(1)	(2)	(3)	(4)	(5)	(6)
<u>SINGLE CROPS</u>					
1. Paddy (Irr.)	13.76	14.12	194.57	47.26	241.83
2. Black Paddy	5.33	7.32	82.50	20.01	102.51
3. Jowar	295.62	4.47	59.14	20.23	79.37
4. Vairaja	357.52	7.13	84.13	32.68	116.81
5. Bajra	74.26	6.98	95.35	18.00	113.35
6. Korra	14.97	10.35	104.43	23.82	128.25
7. Coriander	7.55	3.18	107.55	1.85	109.40
8. Ragi	43.17	15.48	207.43	41.17	248.60
9. Chillies	6.82	8.01	493.02	3.96	496.98
10. Groundnut	110.50	5.15	102.12	8.78	110.90
11. Virginia tobacco	85.96	4.21	366.86	4.77	371.63
12. Country tobacco	24.19	6.41	149.74	9.88	159.62
13. Cotton	26.73	2.05	56.21	0.75	56.96
14. Greengram	37.70	2.81	35.15	0.04	35.19
15. Bengalgram	4.75	3.13	57.22	-	57.22
16. Horsegram	5.40	0.54	9.24	-	9.24
17. Vegetables	2.19	2.19	283.13	4.57	287.80
18. Castor	42.88	1.54	24.52	-	24.52
19. Gingelly	3.25	1.54	47.65	6.92	54.57
20. Fodders	51.10	8.87	26.07	-	26.07
21. Arikalu	1.25	6.42	57.60	24.00	81.60
<u>MIXED CROPS</u>					
22. Jowar+Redgram	103.45	Jowar 4.28 Redgram 1.06	70.05	23.89	93.94
23. Jowar+Redgram etc.	101.36	Jowar 2.44 Redgram 0.89 Greengram 0.23 Sannhemp 0.23 Gingelly 0.03	52.80	25.37	78.17
24. Jowar+Greengram etc.	29.00	Jowar 1.92 Greengram 0.15 Sannhemp 0.25	33.19	9.28	42.47

Main Product per acre, Value of main product, by product and total output per acre

(Value in Rs.)

Crop	Acreage		Yield per acre (in mds.)	Value of Main product per acre	Value per acre of by product	Total output Col. (4)+Col.(5)
(1)	(2)		(3)	(4)	(5)	(6)
<u>MIXED CROPS (CONTD.)</u>						
25. Variga + Jowar	209.78	Variga	7.88	110.58	25.87	136.45
		Jowar	1.33			
26. Bajra + Castor	12.89	Bajra	2.84	38.79	9.29	48.03
		Castor	-			
27. Bajra + Redgram	91.88	Bajra	2.33	44.62	13.82	58.44
		Redgram	1.01			
28. Bajra + Redgram etc.	266.14	Bajra	2.93	68.97	20.21	89.18
		Redgram	0.91			
		Greengram	0.18			
		Sannhemp	0.36			
		Jowar	0.06			
		Gingelly	0.07			
		Castor	0.21			
		Cotton	0.02			
29. Bajra + Others	13.18	Bajra	2.48	47.15	15.83	62.98
		Greengram	0.10			
		Sanhemp	0.03			
		Gingelly	0.03			
		Jowar	0.64			
		Cotton	0.07			
30. Korra + Jowar	16.20	Korra	4.21	53.06	27.78	80.84
		Jowar	0.80			
31. Korra + Jowar etc.	15.22	Korra	4.41	69.97	27.84	97.81
		Jowar	1.44			
		Redgram	0.29			
		Greengram	0.02			
		Gingelly	0.05			
		Sannhemp	0.04			

Contd.

Stratum - 2.

Yield, Product per acre, Value of main product, by product and total output per acre

(Value in Rs.)

Crops	Acreage		Yield per acre (in mds.)	Value of Main product per acre	Value per acre of by product	Total output Col.(4)+Col.(5)
(1)	(2)		(3)	(4)	(5)	(6)
<u>MIXED CROPS (CONTD.)</u>						
32. Korra + Redgram etc.	.41.38	Korra Redgram Castor Sannhemp Gingelly Greengram Jowar	3.58 0.66 0.18 0.24 0.06 0.13 0.24	59.68	21.73	81.41
33. Korra + Cotton	20.02	Korra Cotton	4.09 1.21	74.95	13.14	88.09
34. Korra + Castor etc.	11.63	Korra Castor Cotton Sannhemp	3.14 0.28 0.26 0.03	43.98	12.21	56.19
35. Coriander + Jowar	2.95	Coriander Jowar	2.54 1.14	100.99	4.91	105.90
36. Groundnut + Redgram	28.69	Groundnut Redgram	4.50 1.42	107.82	10.39	118.21
37. Groundnut + Castor	9.50	Groundnut Castor	4.38 0.15	89.24	1.99	91.13
38. Groundnut + Cotton	8.10	Groundnut Cotton	3.47 1.00	96.23	4.57	100.80
39. Cotton + Gingelly	12.75	Cotton Gingelly	1.62 0.43	57.72	2.71	60.43

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Table No. 5.11

Stratum-3

Main Product Per Acre, values of main product,
by-product and total output per acre
(in Rs.)

Sl.No.	Crop	Acreage	Yield per acre (in maunds)	Value per acre of		
				Main pro- duct	By- pro- duct	Total output Col(4)+ Cr(5)
(1)	(2)	(3)	(4)	(5)	(6)	
1.	Paddy	195.12	22.61	282.63	52.62	335.25
2.	Jowar	419.99	3.72	47.47	16.89	64.36
3.	Variga	59.67	4.86	52.29	11.63	63.92
4.	Bajra	72.56	1.58	21.41	13.41	34.82
5.	Korra	23.90	1.06	12.20	6.02	18.22
6.	Chillies	45.63	1.55	107.71	2.51	110.22
7.	Groundnut	61.49	4.45	79.43	1.83	81.26
8.	Country Tobacco	4.50	5.54	203.21	1.78	204.99
9.	Cotton	2.00	1.64	40.18	--	40.18
10.	Greengram	253.50	1.20	16.61	--	16.61
11.	Bengalgram	15.77	2.50	37.03	--	37.03
12.	Horsegram	26.25	2.83	37.98	0.95	38.93
13.	Vegetables	1.75	7.73	103.97	--	103.97
14.	Castor	9.15	1.49	19.61	--	19.61
15.	Fodders	11.90				38.66
<u>MIXED CROPS:</u>						
16.	Jowar+Cucumber	65.65	Greengram: 0.96 Redgram: 1.29	81.50	16.41	77.91
17.	Jowar+Redgram	12.50	Jowar: 7.62 Redgram: 0.67 Greengram: 1.36	125.59	72.00	197.59
18.	Jowar+Greengram	11.00	Jowar 5.13 Greengram 1.05	80.00	75.45	155.45
19.	Jowar+Greengram	61.93	Jowar 4.17 Greengram 0.20	55.98	14.42	70.40
20.	Bajra + Jowar	0.49	Bajra 1.20 Jowar 0.63	24.30	40.82	65.12
21.	Bajra + Redgram	6.25	Bajra 0.57 Redgram 0.37	12.99	4.00	16.99
22.	Bajra+Cotton	1.75	Bajra 2.94 Cotton --	13.55	22.86	36.41
23.	Korra+Redgram	5.90	Korra 0.91 Redgram 0.55	18.30	2.54	20.84
24.	Korra + Cotton	15.00	Korra 0.46 cotton 0.57	19.26	3.87	23.13
25.	Groundnut+Redgram:	287.49	Groundnut 6.28 Redgram 1.12	128.04	2.29	130.33
26.	Greengram+Redgram:	65.65	Greengram 0.96 Redgram 1.29	31.64	0.46	32.10
27.	Castor+Horsegram:	1.00	Castor 3.04 H.Gram --	40.01	--	40.01
28.	Redgram+ Pillipesara:	1.00				50.00

It may be seen that from the point of view of gross output per acre, the leading crops in S₁ are virginia tobacco (Rs.614.9), irrigated paddy (Rs. 303.2), chillies (Rs.293.7), country tobacco (Rs. 260.3), coriander (Rs.153.7), un-irrigated paddy mixed with redgram (Rs.149.5), bajra mixed with cotton (Rs.145.7), jowar (Rs.126.8) and ~~variga~~ ^{groundnut mixed with other crops} (Rs.123.7). The gross output per acre for the majority of ^{the other} crops is found to be less than Rs. 100/-. In S₂, the leading crops, according to gross output per acre, are found to be chillies, (Rs.497.0), virginia tobacco (Rs.371.6), vegetables (Rs.287.8), Ragi (Rs.243.6), irrigated paddy (Rs.241.8), country tobacco (Rs.159.6), and variga mixed with jowar (Rs.136.5). In S₂ also, the gross output per acre in the case of majority of ^{weather} crops is less than Rs.100/-. In S₃, according to the same criterion, the leading crops are in order of importance, irrigated paddy (Rs.335.3), country tobacco (Rs.205.0), jowar mixed with redgram (Rs.197.6), jowar mixed with greengram (Rs.155.5) groundnut mixed with redgram (Rs.135.3) and chillies (Rs.110.2). All the other crops give an output of less than Rs.100/- per acre.

5.5 Input structure and total cost of cultivation.

Complete details of the input structure for all the crops and the total cost of cultivation are given in the following tables Nos. 5.12 to 5.14.

Crop	Extent in acres	Family labour	Hired labour	Bullock labour	Seed	Manures	Hire charges
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Paddy (Irrigated)	9.95	43.71	30.29	44.96	18.32	84.55	0.76
2. Black Paddy	19.97	16.47	13.32	16.84	6.26	27.90	0.29
3. Jowar	152.10	12.47	11.92	28.32	2.80	15.72	2.04
4. Variga	228.88	13.17	11.12	40.18	2.43	39.46	0.99
5. Bajra	29.67	14.34	8.34	24.32	1.76	7.67	0.31
6. Korra	8.50	3.25	10.03	10.34	1.41	-	-
7. Coriander	22.80	20.88	10.31	27.95	13.08	21.67	0.71
8. Taicalu (Ragi)	1.02	109.19	10.06	18.89	2.70	19.61	3.03
9. Chillies	81.51	16.67	31.88	22.69	12.97	66.68	0.37
10. Groundnut	44.99	8.24	24.28	12.20	28.01	6.60	0.30
11. Virginia tobacco	129.62	24.53	72.76	44.10	25.16	66.43	12.14
12. Country tobacco	50.75	27.39	21.14	26.77	17.28	66.82 f	1.67
13. Cotton	31.65	9.66	13.06	13.78	2.18	30.90	0.32
14. Greengram	35.37	12.82	11.39	12.11	4.76	6.32	0.97
15. Bengalgram	3.90	13.53	8.34	13.97	9.10	14.02	1.09
16. Horsegram	0.49	0.31	4.08	10.20	6.12	5.13	2.04
17. Vegetables	5.30	105.34	14.73	15.72	11.51	47.36	2.55
18. Fodders	10.83	9.45	7.68	16.49	8.42	16.54 Pest	0.09
19. Miscellaneous	3.80	238.77	42.11	6.05	1.25	2.42	0.59
20. Jowar + Redgram	146.42	14.68	10.50	18.57	3.73	35.00	0.37
21. Jowar + Others	4.10	16.93	2.62	19.87	6.50	1.11	0.37
22. Variga + Others	3.55	14.95	10.04	20.48	4.37	-	1.06
23. Bajra + Castor	30.25	12.71	5.22	19.19	2.09	23.38	0.43
24. Bajra + Redgram	29.42	9.91	6.59	8.43	1.88	-	0.17
25. Redgram + Others	3.90	19.17	15.61	9.79	6.29	1.28	0.13
26. Groundnut + Others	11.25	15.19	16.20	14.29	24.76	-	0.97
27. Bajra + Cotton	1.50	14.84	20.67	6.68	2.67	-	-

N.B:-- f = fuel ; Pest = Pesticide.

Table No. 5.12 (contd.)

Crop	Depreciation (9)	Interest on crop loan (10)	Land Revenue (11)	Rent or Rental value (12)	Interest on family charges (13)	Total cost (14)
1. Paddy (Irrigated)	14.14	0.61	8.96	90.73	2.76	339.79
2. Black Paddy	2.83	0.15	2.22	53.31	0.47	140.06
3. Jowar	4.11	0.01	2.59	72.89	0.74	153.61
4. Variga	4.26	-	1.86	40.34	1.00	154.81
5. Bajra	2.61	0.42	1.84	44.73	0.38	106.72
6. Korra	3.21	-	1.96	22.94	0.97	54.41
7. Coriander	4.60	-	2.72	54.85	0.63	157.40
8. Taidalu (Ragi)	3.64	-	1.78	48.04	0.44	217.38
9. Chillies	5.56	-	5.39	39.95	1.36	203.52
10. Groundnut	2.31	-	2.93	40.27	0.99	126.13
11. Virginia tobacco	24.53	-	5.67	110.48	6.93	459.55
12. Country tobacco	6.67	-	4.18	57.84	0.81	194.65
13. Cotton	3.85	-	2.63	21.80	0.75	74.35
14. Greengram	2.67	0.56	1.50	51.59	0.38	112.77
15. Bengalgram	2.31	0.65	1.88	51.79	0.34	107.53
16. Horsegram	6.22	0.04	1.53	26.53	0.65	57.72
17. Vegetables	35.62	0.09	1.20	61.13	9.01	320.80
18. Fodders	2.62	-	2.17	74.52	0.40	124.27
19. Miscellaneous	8.31	0.87	0.55	20.26	0.51	354.27
20. Jowar + Redgram	2.20	0.09	2.27	50.96	0.44	104.92
21. Jowar + Others	2.67	-	1.17	71.71	0.35	122.19
22. Variga + Others	2.59	1.31	1.07	46.48	0.46	126.19
23. Bajra + Castor	0.92	-	1.91	30.52	0.15	73.14
24. Bajra + Redgram	2.64	0.02	1.77	26.63	0.61	58.65
25. Redgram + Other	3.13	-	1.59	94.62	0.37	151.98
26. Groundnut + Others	0.81	-	2.52	30.93	0.50	106.17
27. Bajra + Cotton	2.92	-	2.26	20.00	0.37	70.41

Crop	Extent (in acres)	Human labour		Bullock labour	Seed	Manures etc	Hire charges	Depre- ciation	Interest on crop loan
		Family	Hired labour						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Irrigated Paddy	13.76	39.18	38.64	40.87	31.38	13.14	0.78	2.47	0.20
2. Black Paddy	5.33	18.48	15.45	19.23	7.55	-	0.69	1.39	-
3. Jowar	295.62	18.45	7.56	27.38	2.46	7.91	0.32	2.54	0.07
4. Variga	357.52	15.66	12.06	33.45	3.14	26.63	0.30	3.01	0.14
5. Bajra	74.26	19.28	13.13	30.18	2.10	13.31	0.65	3.08	0.01
6. Korra	14.97	35.70	13.70	35.47	3.71	1.00	0.42	3.91	0.09
7. Coriander	7.55	9.40	12.35	20.06	14.04	-	-	2.56	-
8. Ragi	43.17	88.30	43.04	87.83	6.60	35.76	1.18	6.78	0.03
9. Chillies	6.82	53.95	51.48	29.24	39.74	132.83	8.30	7.01	0.05
10. Groundnut	110.50	13.69	18.53	20.52	22.56	13.48	0.03	2.29	0.11
11. Virginia tobacco	85.96	10.27	82.23	25.81	16.11	63.69	-	18.01	-
12. Country tobacco	26.57	36.93	19.22	25.60	18.38	32.63	0.50	3.83	0.02
13. Cotton	26.73	9.70	2.41	13.35	1.63	-	0.04	1.92	-
14. Greengram	37.70	5.45	11.04	11.30	4.99	-	-	1.89	-
15. Bengalgram	4.75	4.85	1.17	6.08	5.26	-	-	1.32	-
16. Horsegram	5.40	13.12	1.44	4.64	2.55	-	-	1.61	0.24
17. Vegetables	2.19	150.80	71.46	125.17	47.47	139.84	5.32	6.66	-
18. Castor	42.88	11.03	3.46	19.26	1.96	0.58	0.07	1.40	0.04
19. Gingelly	3.25	11.73	1.12	6.75	1.19	-	0.25	0.76	-
20. Fodders	51.10	5.11	1.93	9.69	5.32	-	-	2.30	0.04
21. Arikalu (Varagu)	1.25	15.43	4.32	8.86	1.20	-	-	0.67	-
22. Jowar + Red Redgram	163.35	12.22	10.24	15.53	3.37	0.20	0.31	1.45	0.12
23. Jowar + Redgram etc.	101.36	10.27	5.42	14.04	2.46	0.61	0.12	1.37	0.52
24. Jowar + Greengram	29.00	10.80	2.33	12.23	1.51	-	-	1.34	-
25. Variga + Jowar	209.78	23.03	9.53	43.58	2.20	42.10	0.19	3.17	0.05
26. Bajra + Castor	12.89	9.37	12.26	11.96	2.25	-	0.54	1.13	-
27. Bajra + Redgram	91.88	11.03	9.02	14.05	1.64	-	0.45	1.55	0.02
28. Bajra + Redgram etc.	266.14	14.92	4.90	21.84	2.20	0.86	0.19	1.52	0.01
29. Bajra + Others	13.18	8.81	3.87	10.05	3.62	-	0.12	1.65	-
30. Korra + Jowar	16.20	6.73	3.73	15.22	1.13	-	-	2.14	-

Contd.

Table No. 5.13.

Value of inputs per acre in 1959-60 (in Rs.) (Contd.)

Crop	Extent (in acres)	Human labour		Bullock labour	Seed	Manures etc.	Hire charges	Depre- ciation	Interest on crop loan
		Family labour	Hired labour						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
31. Korra + Jowar etc.	15.81	16.53	3.52	26.45	2.66	-	0.57	1.61	-
32. Korra + Redgram etc.	41.38	17.17	4.66	30.21	2.18	-	-	1.72	0.01
33. Korra + Cotton	20.02	17.26	4.38	19.95	2.95	-	-	1.56	0.72
34. Korra + Castor	11.63	21.61	3.03	26.15	2.05	0.52	-	1.10	-
35. Coriander + jowar	2.85	15.69	6.32	30.84	13.68	3.51	-	2.23	-
36. Groundnut + Redgram	23.69	19.34	10.93	12.46	26.43	2.16	-	1.29	0.09
37. Groundnut + Castor	9.50	15.37	13.36	27.34	32.77	6.50	-	1.91	-
38. Groundnut + Cotton	8.10	27.67	9.38	9.50	24.07	-	0.23	0.85	-
39. Cotton + gingelly	12.75	16.52	-	19.10	1.57	-	-	2.63	-

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Table No.5-14

Stratum-3:

Value of Inputs per acre in 1959-60 (in Rupees)

CROP	Extent in (Acres)	Family Hired		Bullo- ck labour	Seed	Manu- res	Hire cha- rges	Dep- reci- ation	Int ^{erest} on crop pro- duction	Land Revenue	Rent or Rental value	Intere- st on Fixed Capital	Total inputs
		labour	labour										
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1. Paddy	195.12	56.61	61.55	72.96	29.46	28.22	0.10	5.44	2.38	6.99	95.98	1.00	360.69
2. Jowar	419.99	16.64	7.64	18.56	2.54	4.27	0.10	1.66	0.11	0.92	20.98	0.32	73.74
3. Variga	59.67	9.46	7.10	20.24	2.46	13.17	0.02	1.76	0.47	0.75	17.43	0.31	73.17
4. Bajra	72.56	7.64	4.16	12.32	1.83	5.22	0.06	0.98	0.48	0.69	10.77	0.16	44.31
5. Korra	23.90	5.94	3.15	9.25	1.50	2.93	--	0.71	0.53	1.01	12.85	0.09	37.96
6. Chillies	45.63	16.99	23.28	27.36	19.12	18.94	0.23	2.32	0.02	4.39	60.95	0.48	174.08
7. Groundnut	61.49	12.72	13.97	20.99	29.31	15.30	0.04	2.00	0.47	2.25	29.68	0.36	127.09
8. Country Tobacco	4.50	32.62	28.89	40.95	19.56	3.33	--	3.40	1.20	2.26	51.33	0.72	184.26
9. Cotton	2.00	4.95	24.86	16.82	2.50	--	--	2.23	--	3.02	5.00	0.63	60.06
10. Greengram	253.50	8.65	5.45	12.27	3.25	8.00	0.10	1.48	0.28	0.81	21.16	0.23	61.68
11. Bengalgram	15.77	7.70	2.87	14.86	6.66	--	--	1.38	0.10	0.41	25.81	0.28	60.07
12. Horsegram	26.25	10.58	1.32	13.90	2.24	--	--	0.96	0.08	0.66	11.83	0.15	41.72
14. Castor	9.15	3.61	7.00	3.99	2.13	--	--	0.93	--	0.90	7.68	0.19	26.43
15. Fodders	11.90	9.04	5.22	1.33	9.92	--	--	0.07	0.58	--	21.09	0.01	47.26
16. Jowar+Cucumber	418.08	12.09	13.06	21.30	2.61	4.69	0.05	2.38	0.25	1.09	32.23	0.42	90.17

Table No. 5.4. (Contd.)

Stratum-3:

Value of inputs per acre in 1959-60 (in Rupees)

Crop	Extent in (acres)	Family labour	Hired labour	Bullo- ck labour	Seed	Manu- res	Hire cha- rges	Dep- reci- ation	Int ^{new} on crop produ- ction	Land Reve- nue	Rent or Rental value	Inte- rest on fixed capital	Total inputs
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
17. Jowar+Redgram etc	12.50	13.51	22.69	30.15	2.15	11.20	--	3.31	2.10	1.46	10.90	0.54	98.01
18. Jowar+Greengram	11.00 11.00	8.10 8.10	16.65 16.65	15.79 15.79	2.32 2.32	--- ---	0.81 0.81	1.71 1.71	0.91	0.56	46.18	0.36	92.56
19. Jowar+Greengram	61.93	28.10	7.21	18.79	2.45	3.32	0.81	2.52	0.14	0.99	37.44	0.46	102.29
20. Bajra + Jowar	0.49	18.29	3.27	11.43	2.55	--	--	0.35	--	1.94	10.61	0.04	48.48
21. Bajra +Redgram	6.25	11.45	1.12	13.88	2.24	--	--	1.11	--	0.41	4.29	0.22	34.72
22. Bajra + Cotton	1.75	4.07	3.77	17.79	2.57	--	--	0.74	--	0.82	4.00	0.09	33.85
23. Korra + Redgram	5.90	17.58	2.11	17.45	3.06	8.47	--	1.75	--	1.27	29.94	0.24	81.87
24. Korra + Cotton	15.00	10.54	3.10	11.65	3.08	7.67	--	0.99	0.03	1.18	14.47	0.09	52.30
25. Groundnut + P.Gram	237.49	10.78	21.77	14.98	29.59	6.93	--	1.74	0.25	2.29	38.91	0.31	127.55
26. Greengram+Redgram	65.65	18.97	9.08	11.56	3.81	13.02	0.17	2.19	0.35	1.08	42.61	0.35	103.18
27. Castor + Horsegram	1.00	43.39	--	8.96	5.00	--	--	1.17	--	0.56	5.00	0.14	64.22
28. Redgram + Pilli pesara	1.00	46.52	1.85	18.69	1.62	--	--	0.18	1.00	--	50.00	0.03	119.89

The information is collected in the Farm Surveys we have conducted. It may be seen that the important inputs in the case of almost all the crops are human labour, materials including bullock labour and fuel, and rent or rental value. The total cost of cultivation per acre is comparatively high in S_1 for crops like virginia tobacco, country tobacco, irrigated paddy, and vegetables. In S_2 , the total cost of cultivation per acre is comparatively high for crops like vegetables, chillies, ragi, irrigated paddy and virginia tobacco. Similarly in S_3 , the total cost of cultivation per acre is high for crops like irrigated paddy, vegetables, country tobacco and groundnut.

5.6 Value added to material inputs, profits and different types of income.

The details of input-output structure and values of output collected in ^{own} the Farm Surveys are also studied for the purpose of determining the contribution of various crops to the regional incomes of the three strata and returns accruing to land and capital invested by the farmers and to the labour input of farm families. Gross value added, per acre, is found to be highest in the case of virginia tobacco in S_1 , amounting to Rs. 402.2. Next in order of importance are chillies, irrigated paddy, and country tobacco. In S_2 , the important crops from this point of view appear to be virginia tobacco, chillies and irrigated paddy. On the other hand, in S_3 , the leading crops appear to be irrigated paddy, jowar mixed with redgram, and country tobacco. We thus find that in all the three strata,

crops like virginia tobacco, country tobacco, irrigated paddy, and chillies are the most profitable crops. Estimates of farm family labour income, farm business income and farm investmentⁱⁿ come also reveal that these crops are the most valuable crops. For instance, it is found that farm business income per acre in S_1 is Rs. 263.0 in the case of virginia tobacco and Rs. 147.2 in the case of chillies. In S_2 , farm business income per acre is highest in the case of chillies amounting to Rs. 223.8 and in the case of the next important crop virginia tobacco, it amounts to Rs. 150.7. In S_3 , the maximum amount of farm business income is Rs. 124.5 in the case of jowar + Redgran. Next in order of importance are found to be Jowar + Greengran and irrigated ^{paddy} giving ~~paddy~~ farm business income amounting to Rs. 117.53 and Rs. 107.26 respectively. Details are given in ^{the following} tables Nos. 5.15 to 5.17.

Stratum - 1.

Table No. 5.15

TYPES OF INCOMES P F R A C R F OF VARIOUS CROPS
(in Rs.)

Crop	Value of total output	Total inputs Cost C	Net Profit on loss	Farm family labour income	Farm Business income	Farm investment income
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Irr. Paddy	303.16	339.70	- 36.63	7.03	98.56	54.85
2. Black Paddy	94.33	140.06	- 45.73	- 20.26	13.26	1.70
3. Jowar	126.30	153.61	- 26.81	- 14.34	42.30	20.83
4. Variga	119.01	154.81	- 35.80	- 22.63	12.20	- 9.97
5. Bajra	57.63	106.72	- 49.09	- 34.75	9.11	- 5.23
6. Korra	30.74	54.14	- 23.40	- 20.15	3.77	0.52
7. Coriander	158.72	157.40	1.32	22.20	65.62	44.74
8. Ragi	115.69	217.38	-101.69	7.50	55.03	- 53.21
9. Chillies	203.65	203.52	00.13	106.80	147.23	130.56
10. Ground Nut	119.63	126.13	- 6.50	1.74	43.00	34.76
11. Virginia tobacco	614.80	459.55	155.34	170.87	262.00	233.46
12. Country tobacco	260.70	194.65	66.14	93.53	150.21	122.32
13. Cotton	48.62	74.35	- 25.73	- 16.07	2.37	- 7.20
14. Greengram	62.03	112.77	- 50.74	- 37.92	3.87	- 8.95
15. Bengalgram	43.52	107.53	- 64.01	- 50.43	-17.53	- 31.11
16. Horsegram	61.32	57.72	3.60	3.01	31.00	30.78
17. Vegetables	100.56	320.80	-220.24	-114.00	- 50.42	-155.76
18. Fodders	51.43	124.27	- 72.84	- 63.50	- 3.34	- 12.70
19. Miscellaneous	92.63	354.27	-261.64	- 22.87	- 2.10	-240.87
20. Jowar + Ragi	106.68	104.92	1.77	16.45	61.72	47.04
21. Jowar+Others	79.05	122.19	- 43.14	- 26.21	- 1.47	- 18.40
22. Variga+Others	67.04	126.19	- 59.15	- 44.20	-14.16	- 20.11
23. Bajra+castor	40.55	73.14	- 32.59	- 19.83	6.02	- 4.60
24. Bajra+ Redgram	35.15	58.65	- 23.50	- 13.50	9.56	- 0.35
25. Redgram+Black Paddy	149.51	151.93	- 2.42	16.70	55.23	36.11
26. Ground Nut+Others	123.70	103.17	17.53	32.73	64.15	43.96
27. Bajra+cotton	145.66	70.41	75.25	90.09	110.46	95.62

(Contd.)

TYPES OF INCOME PER ACRE OF VARIOUS CROPS (Contd.)
(in Rs.)

	Farm Business income + rent paid (8)	Value added to materials	
		Gross (9)	Net (10)
1. Irrigated Paddy	100.57	154.57	140.43
2. Black Paddy	24.52	43.04	40.21
3. Jowar	50.20	77.92	73.81
4. Variga	18.71	35.95	31.60
5. Bajra	10.36	23.57	20.06
6. Korra	3.37	18.00	15.78
7. Coriander	77.63	95.31	90.71
8. Ragi	55.03	71.46	67.82
9. Chillies	148.11	190.04	185.33
10. Groundnut	43.00	72.52	70.21
11. Virginia tobacco	207.23	400.24	375.71
12. Country tobacco	152.13	184.17	177.50
13. Cotton	6.43	26.02	22.17
14. Greengram	14.05	30.17	27.50
15. Bengalgram	2.25	13.23	11.02
16. Horsegram	31.00	42.06	36.74
17. Vegetables	-44.76	6.83	-23.74
18. Fodders	11.53	24.01	21.30
19. Miscellaneous	-2.10	40.74	41.43
20. Jowar + Redgram	67.85	82.91	80.71
21. Jowar + Others	45.85	52.31	49.64
22. Variga + Others	2.74	17.75	15.16
23. Bajra + Castor	10.70	18.84	17.02
24. Bajra + Redgram	12.83	24.67	22.03
25. Redgram + Others	111.60	132.02	126.00
26. Groundnut + Others	64.15	83.63	82.87
27. Bajra + Cotton	110.43	136.31	133.30

Types of income per acre of various Crops (in Rs.)

Sl. No.	Crop	Value of total output	Value of total inputs	Net profit (or loss)	Farm F.L.I.	F.B.I.	F.I.I.	F.B.I.+ rent paid	Value added to materials	
									Gross	Net
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
1.	Irrigated Paddy	241.83	261.64	-19.81	19.37	102.85	63.67	106.85	155.66	153.19
2.	Black Paddy	102.51	118.72	-16.21	2.27	54.96	36.48	56.31	75.04	73.65
3.	Jowar	79.37	107.98	-28.61	-10.16	24.46	6.01	29.46	41.30	38.76
4.	Variga	116.81	145.71	-28.90	-13.24	29.46	13.80	35.73	53.29	50.28
5.	Bajra	113.35	133.42	-20.07	-0.79	36.75	17.47	49.16	67.11	64.03
6.	Korra	128.25	132.77	-4.52	31.18	61.11	25.41	68.86	87.65	83.74
7.	Coriander	109.40	108.14	1.26	10.66	57.42	48.02	57.42	75.30	72.74
8.	Ragi	249.60	330.82	-82.22	6.08	49.01	-39.29	66.26	117.23	110.45
9.	Chillies	496.38	402.58	94.40	153.35	223.82	164.87	223.89	236.87	279.86
10.	Groundnut	110.90	133.71	-22.81	-9.12	28.39	15.20	30.47	54.31	52.02
11.	Virginia tobacco	371.63	292.15	79.48	89.75	150.67	140.40	158.52	266.02	248.01
12. Country tobacco	358.96	339.24	-21.28	21.42	289.88	119.13	219.02	219.02	219.02	219.02
13.	Country tobacco	159.52	197.39	-38.27	-1.34	52.98	16.05	55.37	82.51	78.63
13.	Cotton	56.96	59.24	-2.28	7.42	20.83	11.13	21.02	41.94	40.02
14.	Greengram	35.19	68.83	-33.64	-28.19	-4.23	-9.68	4.67	18.90	17.01
15.	Bengalgram	57.22	40.50	16.72	21.57	26.48	21.63	43.32	45.88	44.56
16.	Horsegram	9.24	61.30	-52.06	-38.94	-4.06	-17.18	-2.58	2.05	0.44
17.	Vegetables	287.30	711.11	-423.31	-272.51	-227.15	-377.95	-109.23	-30.00	-36.66
18.	Castor	24.52	55.63	-31.16	-20.08	-6.47	-17.55	-3.13	2.65	1.25
19.	Gingelly	51.57	47.61	6.96	18.69	41.24	29.51	43.55	46.33	45.62
20.	Fodders	26.07	86.12	-60.05	-54.94	2.52	-2.59	2.52	11.06	8.76
21.	Arikalu (Varagu)	81.30	52.04	29.56	45.04	65.11	49.63	65.11	71.54	70.87
22.	Jowar + Redgram	92.94	48.43	45.46	57.68	89.46	77.24	92.02	74.53	73.03
23.	Jowar + Redgram etc.	78.17	55.38	22.79	33.06	43.54	38.27	52.44	60.94	59.57
24.	Jowar + Greengram	42.47	38.09	4.38	15.18	21.07	10.27	24.78	28.68	27.34
25.	Variga + Jowar	136.45	169.39	-32.94	-9.86	27.03	3.95	29.24	43.33	40.21
26.	Bajra + Castor	48.08	74.55	-26.47	-17.10	18.44	9.07	18.44	33.33	32.20
27.	Bajra + Redgram	53.41	81.26	-27.82	-11.79	27.03	16.00	30.27	42.30	40.75
28.	Bajra + Redgram etc.	88.18	73.27	15.91	30.83	54.58	39.66	56.30	64.04	62.52
29.	Bajra + Others	52.78	67.18	-14.40	4.61	40.60	31.79	40.60	49.19	47.54
30.	Korra + Jowar	80.84	48.47	32.37	39.10	57.79	51.06	57.79	64.49	62.35
31.	Korra + Jowar etc.	97.81	71.50	26.31	42.84	60.11	43.58	62.25	68.13	66.52
32.	Korra + Redgram etc.	81.41	80.69	0.72	17.39	38.61	21.44	41.30	49.02	47.30
33.	Korra + Cotton	88.09	73.12	14.97	32.23	56.54	39.28	59.29	65.19	63.63
34.	Korra + Castor etc.	56.19	84.04	-27.85	-6.24	21.84	0.73	21.84	27.47	26.37
35.	Coriander + Jowar	105.90	101.52	4.38	20.11	46.75	31.06	46.75	57.87	55.59
36.	Groundnut + Redgram	118.21	104.42	13.79	33.13	57.20	37.86	62.78	77.11	75.82
37.	Groundnut + Castor	91.13	133.63	-42.50	-27.13	7.15	-8.22	7.15	24.52	22.61
38.	Groundnut + Cotton	100.80	120.39	-19.59	8.08	53.43	25.76	53.43	66.95	66.10
39.	Cotton + Gingelly	60.43	55.19	5.24	21.76	30.95	14.43	35.66	39.76	37.13

BPR.

N.B:- F.L.I.: Family labour income; F.B.I.: Farm Business income; F.I.I.: Farm investment income

Value of inputs per acre in 1959-60 (in Rs.)

Crop	Land Revenue (11)	Rent or rental value (12)	Interest on Fixed Capital (13)	Total (14)
1. Irrigated Paddy	7.50	87.12	0.36	261.64
2. Black Paddy	1.89	53.88	0.16	118.72
3. Jowar	1.67	39.03	0.59	107.98
4. Varisa	2.35	48.25	0.72	145.71
5. Bajra	1.73	49.29	0.66	133.42
6. Korra	1.09	37.13	0.55	132.77
7. Coriander	2.97	46.27	0.49	108.14
8. Ragi	1.12	59.17	1.01	330.82
9. Chillies	4.44	68.84	1.70	402.58
10. Groundnut	2.91	39.18	0.41	133.71
11. Virginia tobacco	7.26	62.92	5.85	292.15
12. Country tobacco	3.52	56.32	0.89	197.89
13. Cotton	2.06	27.80	0.33	59.24
14. Greengram	1.29	31.99	0.38	68.33
15. Bengalgram	0.07	21.48	0.27	40.50
16. Horsegram	1.34	35.99	0.37	61.30
17. Vegetables	1.11	161.96	1.32	711.11
18. Castor	0.93	16.67	0.23	55.68
19. Gingelly	0.95	24.77	0.09	47.61
20. Fodders	4.22	56.77	0.69	86.12
21. Arikalu (Varagu)	1.44	20.00	0.07	52.04
22. Jowar + Redgram	1.38	3.41	0.25	48.48
23. Jowar + Redgram etc.	1.09	19.15	0.23	55.38
24. Jowar + Greengram	0.23	9.38	0.22	38.09
25. Varisa + Jowar	1.39	38.56	0.54	169.39
26. Bajra + Castor	1.50	35.34	0.20	74.55
27. Bajra + Redgram	1.44	41.84	0.22	81.26
28. Bajra + Redgram etc.	1.31	25.24	0.23	73.27
29. Bajra + Others	3.07	35.51	0.48	67.18
30. Korra + Jowar	0.83	18.40	0.29	38.47
31. Korra + Jowar etc.	0.75	19.22	0.19	71.50
32. Korra + Redgram etc.	0.83	23.65	0.26	80.69
33. Korra + Cotton	1.24	24.79	0.27	84.04
34. Korra + Castor	1.45	27.93	0.15	73.12
35. Coriander + Jowar	2.56	26.32	0.32	101.52
36. Groundnut + Redgram	2.03	29.42	0.22	104.42
37. Groundnut + Castor	2.10	34.05	0.23	120.29
38. Groundnut + Cotton	3.29	45.22	0.13	133.63
39. Cotton + Gingelly	1.47	13.41	0.49	55.19

Types of Income per acre of various crops (in Rs.)

CROP	Value of total output	Value of total inputs	Net Profit (or loss)	Farm family labour income	Farm business income	Farm investment income	Farm business rent paid	Value added to materials	
								Gross	Net
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Irrigated Paddy	335.25	360.69	-25.44	31.17	107.26	50.65	128.15	204.51	199.07
2. Jowar	64.86	73.74	- 9.38	7.26	25.38	8.74	28.56	38.89	37.23
3. Variga	63.92	73.17	- 9.25	0.21	8.11	-1.35	17.95	28.03	26.27
4. Bajra	34.82	44.31	- 9.49	- 1.85	8.65	1.01	9.08	15.39	14.41
5. Irrigated Paddy	18.22	37.96	-19.74	-13.80	-0.86	-6.80	- 0.86	4.54	3.83
6. Chillies	110.22	174.08	-63.86	-46.87	12.96	-4.03	14.56	44.57	42.25
7. Groundnut	81.26	127.09	-45.83	-33.11	-6.82	-19.54	- 3.07	15.62	13.62
8. Country Tobacco	204.99	184.26	20.73	53.35	98.51	65.89	105.40	141.15	137.75
9. Cotton	40.18	60.06	-19.88	-14.93	- 9.30	-14.25	- 9.30	20.86	18.58
10. Greengram	16.61	61.68	-45.07	-36.42	-17.85	-26.50	-15.03	-7.01	-8.49
11. Bengal gram	37.03	60.07	- 23.04	- 15.34	- 6.37	-14.07	10.75	15.51	14.13
12. Horsegram	38.93	41.72	-2.79	7.79	19.73	9.15	19.77	22.79	21.83
13. Vegetables	103.97	240.62	-136.65	-30.00	-22.20	-128.72	31.64	52.78	49.53
14. Castor	19.61	26.43	- 6.82	- 3.21	4.66	1.05	4.66	13.49	12.56
15. Fodders	38.66	47.26	- 8.60	0.44	10.87	1.83	21.54	27.41	27.34
16. Jowar+Cucumber	77.91	90.17	-12.26	-0.17	27.84	15.75	32.48	49.26	46.88
17. Jowar+Redgram etc	197.49	98.01	99.58	113.09	124.53	111.02	124.53	154.09	150.78
18. Jowar+Greengram	155.45	92.56	62.89	70.99	117.53	109.43	117.53	137.34	135.63

Table No. 5.17 (contd)

Stratum-3

Types of income per acre of various crops (in Rupees) (Contd)

CROP Crop.	Value of total output	Value of total inputs	Net pro- fit or loss	FAMILY family labour income	F.B.I. business income	F.C.I. investment income	Farm business EBITDA + rent paid	Value added to materials.	
								Gross	Net
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
19. Jowar+Greengram etc	70.40	102.29	-31.89	-3.73	29.90	1.74	34.16	45.03	42.51
20. Bajra +Jowar	65.12	48.48	16.64	34.93	45.58	27.29	45.58	51.14	50.79
21. Bajra+Redgram	13.99	34.72	-17.73	- 6.28	-3.37	-14.82	-1 .77	0.87	-0.24
22. Bajra+Cotton	36.41	33.85	2.56	6.63	10.72	6.65	10.72	16.05	15.31
23. Korra+Redgram	20.84	81.87	-61.03	-43.45	-15.07	-32.65	-13.28	-8.14	-9.89
24. Korra + Cotton	23.13	52.30	-29.17	-18.63	-6.64	-17.18	- 3.97	1.33	0.34
25. Groundnut+Redgram	130.33	127.55	2.78	13.56	51.31	40.53	52.78	78.83	77.09
26. Greengram+Redgram	32.10	103.18	-71.08	-52.11	-12.40	-31.37	-9.15	3.54	1.35
27. Castor+Horsegram	40.01	64.22	-24.21	19.18	24.32	-19.07	24.32	26.05	24.88
28. Redgram Redgram+Pillipesara	50.00	119.89	-69.89	-23.37	-23.34	-69.86	26.26	29.69	29.51

Estimates of total agricultural output, total input, total net profit (or loss), total farm business income etc. for the Project area as a whole may be now given stratum-wise in the following table No. 5.18

Table No. 5.13

(In crores of Rs.)

Item	S ₁	S ₂	S ₃	Total
1. Gross agricultural output	10.38	6.40	6.10	23.33
2. Total input	10.67	6.39	7.33	24.94
3. Net profit (or loss)	0.21	-0.49	-1.23	-1.56
4. Gross value-added	6.52	3.62	3.39	13.53
5. Farm business income	4.17	2.59	1.78	8.54

Details are presented in tables Nos. 5.19 to 5.21.

Stratum - 1

Table No. 519

ESTIMATES OF CROPPED AREA, TOTAL OUTPUT, TOTAL INPUTS AND
VARIOUS TYPES OF INCOME

Crop	Area (in acres)	Value of total output	Cost C	Net Profit (or loss)
(1)	(2)	(3)	(4)	(5)
1. Irrigated Paddy	6310.07	2064540.82	2313003.60	-249452.81
2. Black Paddy	15070.52	1506400.15	2236331.03	-730331.83
3. Jowar	83300.41	10637303.00	12336405.33	-2240101.80
4. Variga	133127.31	15643540.67	20609513.27	-4765075.60
5. Bajra	13070.33	1041040.60	1020470.46	-887533.86
6. Korra	1687.45	51372.21	91353.54	-39436.33
7. Coriander	19044.09	3022677.06	2997539.76	+25133.20
8. Ragi	723.10	83665.35	157207.04	-73541.10
9. Chillies	27722.41	3140635.70	5642064.33	2498620.32
10. Groundnut	21575.26	2531043.35	2721237.54	-140239.19
11. Virginia tobacco	59542.01	36612339.03	27362944.20	9249395.64
12. Country tobacco	47610.22	12416269.27	9267329.32	3148939.45
13. Cotton	4510.06	210760.46	336059.03	-116298.57
14. Greengram	13742.76	1162613.40	2113621.05	-951007.65
15. Bengalgram	2410.64	104911.05	259216.12	-154305.07
16. Horsegram	130.30	11036.66	10435.73	650.23
17. Vegetables	3917.30	393923.60	1256669.34	-862746.15
18. Fodders	5363.63	275354.06	666544.51	-390699.45
19. Miscellaneous	2470.01	229339.39	375369.29	-646439.90
20. Jowar + Kedgram	93593.25	9985463.34	9819803.79	166660.05
21. Jowar + Others	2410.64	199561.09	294556.10	-103995.01
22. Variga + Others	2591.44	173730.14	327013.61	-153283.67
23. Bajra + Castor	13253.54	537633.80	969729.62	-432095.82
24. Bajra + Kedgram	3015.39	231749.96	470102.62	-138361.66
25. Kedgram+Black Paddy	3013.31	450519.93	457062.35	-7442.97
26. Groundnut+Others	6207.41	767356.62	650049.72	100015.90
27. Bajra + cotton	130.30	26335.33	12730.13	13605.20
	602661.00	108813255.97	106744312.96	2065443.01

(Contd.)

Stratum - 1

Table No 5.19 (Contd)

ESTIMATES OF CROPPED AREA, TOTAL OUTPUT, TOTAL INPUTS
TYPES OF INCOMES (CONTD.)

Name of the Crop	Farm F.L.I. (6)	F.B.I. (7)	F.I.I. (8)	F.B.I.+Rent paid (9)
1. Irrigated Paddy	43215.30	571200.50	373532.34	634833.74
2. Black Paddy	-467207.42	291621.70	23537.23	391507.15
3. Jowar	-1202033.43	3543564.34	2502450.03	4973862.41
4. Variga	-3012632.34	1624150. ²⁸	-129133.93	2490321.33
5. Bajra	-623274.00	164707.25	-94551.51	137307.04
6. Korra	-340002.12	6361.63	377.47	6361.63
7. Coriander	422773.80	1249673.13	852032.50	1470344.01
8. Ragi	5423.93	40434.13	33430.94	40434.13
9. Chillies	2960753.39	4031570.42	3619437.35	4105966.15
10. Groundnut	37540.95	927736.13	749956.04	927736.13
11. Virginia Tobacco	10709033.22	1515650139.00	14193602.32	17700016.23
12. Country tobacco	4452033.33	7151531.15	5347437.22	7245323.23
13. Cotton	-72635.76	10712.31	-32950.51	29239.34
14. Greengram	-719725.46	72534.43	-167747.70	263335.73
15. Bengalgram	-121639.11	-42339.05	974995.01	5423.94
16. Horsegram	706.93	5621.07	5565.02	5621.07
17. Vegetables	-450007.77	-197510.27	-610153.65	-175339.25
18. Fodders	-340003.63	-17914.69	63601.47	61943.23
19. Miscellaneous	-1586609.71	-5713879137	-595167609.42	-5253391.71
20. Jowar+Redgram	1539693.96	5776575.39	4402626.43	6350302.01
21. Jowar+Others	-63132.37	-3543.64	-44355.73	110527.34
22. Variga+Others	-114541.65	-34694.79	-75436.22	7199.55
23. Bajra + Castor	-263579.73	106333.49	-62132.55	143059.65
24. Bajra+Redgram	-103929.15	76627.13	-2395.39	102337.45
25. Redgram+Black Paddy	50322.23	166575.73	193910.62	336556.59
26. Groundnut+Others	203106.46	393205.35	303914.79	399205.35
27. Bajra + cotton	16233.27	19971.17	17239.10	19971.17
Total	12300572.93	41746724.60	310114594.60	47333153.95

N.B. :- F.L.I: Farm family labour income.

F.B.I: Farm Business income.

F.I.I: Farm investment income.

(Contd.)

Stratum - 1

Table No. 5.19 (Contd.)

ESTIMATES OF CROPPED AREA, TOTAL OUTPUT, TOTAL INPUTS and
VARIOUS TYPES OF INCOMES (CONTD.)

Crop	Gross value added (10)	Net value added (11)	Estimated L.R. & cesses to Govt. (12)
1. Irrigated Paddy	1052632.52	956333.13	61013.23
2. Black Paddy	677371.13	642174.61	35454.55
3. Jowar	6536740.75	6101951.16	217276.16
4. Variga	4735044.77	4213320.30	247617.73
5. Bajra	426141.50	370953.24	33266.00
6. Korra	32044.63	26627.06	3307.40
7. Coriander	1315002.22	1727430.40	51700.02
8. Ragi	51670.16	40046.75	1237.23
9. Chillies	5293316.07	5130130.37	149423.70
10. Groundnut	1564637.86	1514700.00	63215.51
11. Virginia tobacco	23831454.30	22370066.72	337603.30
12. Country tobacco	8733374.22	8450314.05	100010.72
13. Cotton	117600.36	100207.51	11307.49
14. Greengram	535469.07	515425.00	20144.14
15. Bengalgram	34303.41	20734.33	4532.00
16. Horsegram	7737.17	6642.50	276.62
17. Vegetables	26051.02	-112533.20	4700.76
18. Fodders	123731.06	114723.12	11630.10
19. Miscellaneous	122003.06	102300.80	1359.00
20. Jowar + Redgram	7750316.36	7553011.21	212456.63
21. Jowar + others	126100.53	110364.17	2320.45
22. Variga + others	45008.06	30206.23	2772.34
23. Bajra + Castor	240700.00	237593.04	25323.01
24. Bajra + Redgram	197730.67	176570.04	14107.24
25. Redgram + Black Paddy	307317.19	300335.53	4701.16
26. Groundnut + others	519436.07	514402.07	15642.67
27. Bajra + others	24644.35	24116.01	403.61
	<u>65170553.94</u>	<u>61476532.44</u>	<u>1741100.14</u>

N. B. :- L. R. = Land Revenue

Estimates of total cropped Area, Total output, Total inputs various types of incomes etc. (in Rs.)

Crop	Estimated Total area (in acres)	Value of Total output	Value of total inputs	Net Profit (or loss)	Farm Family labour income	Farm Business Income
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Irrigated Paddy	6626.37	1602455.06	1733723.45	-131263.39	128352.79	631522.15
2. Black Paddy	2167.50	222190.43	257325.60	- 35135.17	4920.23	119125.30
3. Jowar	69545.93	5519360.46	7509569.52	-1989709.06	-706536.65	1701093.45
4. Variga	52267.82	6105404.05	7615944.05	-1510540.00	-692025.94	1539309.93
5. Bajra	14615.17	1656629.52	1949955.98	- 293326.46	-11545.93	537107.50
6. Korra	3529.94	452714.80	468670.13	- 15955.33	110063.53	215714.63
7. Coriander	1357.36	203349.33	200903.98	2340.90	19304.79	106673.32
8. Ragi	12447.67	3094490.76	4117933.19	-1023447.43	75631.83	610060.31
9. Chillies	2415.22	1200316.04	927319.27	227996.77	370373.99	540574.54
10. Groundnut	24771.43	2747157.13	3312194.59	-565037.46	-225915.90	715643.06
11. Virginia tobacco	8236.52	3060937.93	2406299.32	654633.61	739227.87	1240956.47
12. Country tobacco	8484.23	1354232.79	1678944.27	-324691.48	-11363.87	449494.51
13. Cotton	9103.52	513536.50	539292.52	-20756.02	67543.12	139626.32
14. Greengram	4892.37	172162.50	336741.33	-164579.33	-137915.91	-20694.73
15. Bengalgram	1610.15	92132.73	65211.03	26921.70	34730.94	42636.77
16. Horsegram	1734.00	16022.16	106294.20	-90272.04	-67521.96	-7040.04
17. Vegetables	557.36	160403.21	396344.27	-235936.06	-151336.17	-126604.32
18. Castor	14924.82	365956.59	831013.93	-465057.39	-299690.39	-96563.59
19. Gingelly	1176.65	64209.79	56020.31	8139.43	21991.59	48525.05
20. Fodders	5635.51	146917.75	435330.12	-338412.37	-309614.92	14201.49
21. Arikalu	923.93	75300.69	43341.52	27459.17	41339.01	60432.63
22. Jowar + Redgram	44526.74	4182341.96	2153656.36	2024185.60	2568302.36	3933362.16
23. Jowar + Redgram etc.	35732.36	2793237.67	1973835.79	814351.33	1181323.35	1734473.02
24. Jowar + Greengram	13743.17	533334.73	523667.30	60216.93	203697.22	239673.94
25. Variga + Jowar	83975.32	11453432.41	14224579.45	-2766147.04	-327996.66	2269352.90
26. Bajra + Castor	3963.44	190562.20	295474.45	-104912.25	-67774.32	73035.33
27. Bajra + Redgram	28672.99	1675649.54	2329967.17	-654317.63	-333054.55	775030.92
28. Bajra + Redgram etc.	92645.34	3262111.42	6738124.06	1473937.36	2856255.83	5056533.66
29. Bajra + Others	3839.53	241816.75	257942.93	-16126.23	17700.46	155336.95
30. Korra + Jowar	3839.53	310391.65	136104.44	124287.21	150127.53	221339.33
31. Korra + Jowar etc.	11147.17	1090304.70	797022.66	293332.04	477544.76	670056.39
32. Korra + Redgram etc.	17401.96	1416693.56	1404164.15	12529.41	311321.06	671339.63
33. Korra + Cotton	3670.02	763742.06	633951.36	129790.20	279434.74	490202.93
34. Korra + Castor	3591.36	201326.61	301359.91	-100033.30	-22413.21	73446.22
35. Coriander + Jowar	1424.36	150339.72	144601.03	6233.69	23643.33	66533.33
36. Groundnut + Redgram	9041.59	1063306.35	944122.33	124633.52	299547.33	517173.95
37. Groundnut + Castor	1795.93	163663.10	239990.13	-76327.03	-43723.53	1380.90
38. Groundnut + Cotton	3096.44	312121.15	372730.41	-60659.26	25019.24	165442.79
39. Cotton + Gingelly	4644.63	280674.99	256337.13	24337.36	101067.15	143751.30
Total	619287.00	63979406.44	68926613.79	-4947209.35	6200439.49	25938631.00

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Estimates of total cropped Area, Total output, Total inputs various types of incomes etc. (in Rs.)

Table No. 5.20 (contd)

Crop	Farm Invest- ment Income	Farm Business Income rent paid	Value added to materials		Estimated & cesses to
			Gross	Net	
	(8)	(9)	(10)	(11)	(12)
1. Irrigated Paddy	421900.93	703027.63	1031460.75	1015093.62	49697.73
2. Black Paddy	79070.40	122051.93	162649.20	169636.30	4096.53
3. Jowar	417971.04	2043823.10	2372246.91	2695600.25	116141.70
4. Variga	721295.92	1367529.21	2735352.13	2623025.99	122329.33
5. Bajra	255327.02	718481.76	930324.06	935309.34	25234.24
6. Korra	39695.78	243071.67	309399.24	295597.18	3347.63
7. Coriander	39214.44	106673.32	139896.86	135140.74	5517.34
8. Ragi	-439063.95	824732.61	1459240.35	1374345.15	13941.39
9. Chillies	393197.32	540743.61	692354.16	675923.47	10723.53
10. Groundnut	376526.50	754736.99	1345339.03	1233612.39	72035.01
11. Virginia tobacco	1156407.41	1305653.15	2191079.05	2042739.33	59797.14
12. Country tobacco	136171.39	469771.32	700033.32	667115.00	29364.49
13. Cotton	101322.13	191355.99	381301.63	364322.97	13753.25
14. Greengram	-47353.14	22347.37	92465.79	33219.21	6311.16
15. Bengalgram	34327.54	69751.70	73373.63	71743.23	112.71
16. Horsegram	-29790.12	-4473.72	3554.70	762.96	2323.56
17. Vegetables	-210654.21	-60830.43	-16720.30	-20432.82	613.67
18. Castor	-261930.59	-47460.93	39550.77	18656.03	13330.03
19. Gingelly	34722.91	51243.11	54573.03	53673.77	1117.32
20. Fodders	-14595.97	14201.49	76924.71	49367.07	23731.35
21. Arikalu	46102.30	60432.63	66455.65	65333.27	1331.66
22. Jowar + Redgram	3439245.40	4097350.61	3313577.93	3254014.16	61446.90
23. Jowar + Redgram etc.	1367496.55	1873331.13	2177560.49	2123606.47	38943.32
24. Jowar + Greengram	141193.71	340679.65	394297.52	375374.97	3162.03
25. Variga + Jowar	331702.51	2455438.36	3642349.33	3376647.62	116725.69
26. Bajra + Castor	35943.40	73035.33	132101.46	127622.77	5945.16
27. Bajra + Redgram	453767.84	367931.41	1212367.43	1163424.34	41239.11
28. Bajra + Redgram etc.	3674314.13	5215932.64	5933007.57	5792136.66	121365.40
29. Bajra + Others	122660.25	155336.95	183363.94	132533.63	11737.51
30. Korra + Jowar	196043.95	221339.33	247614.51	239397.31	3136.35
31. Korra + Jowar	435793.67	693911.33	759456.69	741509.75	3360.33
32. Korra + Redgram etc.	373093.02	727401.93	353044.03	323112.71	14443.63
33. Korra + Cotton	340553.39	514045.49	565193.60	551673.37	10750.32
34. Korra + Castor	326.13	73446.22	93663.39	94717.35	5203.20
35. Coriander + Jowar	44240.62	66533.33	32427.71	79130.17	3646.36
36. Groundnut + Redgram	342314.60	567631.02	697197.00	635533.35	13354.43
37. Groundnut + Castor	-14762.54	12340.90	44036.20	30605.93	3771.45
38. Groundnut + Cotton	79764.29	165442.79	207306.66	204674.63	10137.29
39. Cotton + Gingelly	67022.01	165627.51	134670.49	172455.11	6327.61
Total	14790939.13	28301430.99	36182605.37	34640115.30	1467471.21

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Table No. 521

Stratum-3

Estimates of total cropped area, total output
total inputs various types of incomes etc.,
(in Rs.)

Crop (1)	Estimated total ar- ea(in acs) (2)	Value of total output (3)	Value of total inputs (4)
1. Irrigated Paddy:	50324.24 79257.45	16871201.46 1318127.24	18151450.13 4894767.52
2. Jowar	194660.79	12528368.44	14354286.65
3. Variga	17627.31	1126737.65	1289790.27
4. Bajra	28894.96	1006122.51	1280335.68
5. Korra	7880.44	143581.62	299141.50
6. Chillies	27443.30	3024800.53	4777329.67
7. Groundnut	22604.43	1836835.98	2872797.01
8. Country Tobacco	691.27	141703.44	127373.41
9. Cotton	1520.79	61105.34	91338.65
10. Greengram	79357.45	1318127.24	4894767.52
11. Bengalgram	4493.24	166384.68	269908.93
12. Horsegram	9746.86	379445.26	406639.00
13. Vegetables	553.02	57497.49	133067.67
14. Castor	2626.81	51511.74	69426.58
15. Fodders	345.63	13362.06	16334.48
16. Jowar+Cucumber	121662.99	9478763.55	10970351.81
17. Jowar+Redgram, etc.	1935.55	382445.32	189703.25
18. Jowar+Greengram	1520.79	2364006.81	140764.32
19. Jowar+Greengram, etc.	8433.46	593715.58	862658.62
20. Bajra+Jowar	138.25	9002.84	6702.36
21. Bajra + Redgram	2212.05	37582.73	76802.38
22. Bajra + Cotton	483.89	17618.43	16379.68
23. Korra +Redgram	2488.56	51861.59	203738.41
24. Korra + Cotton	6774.42	156692.33	354302.16
25. Groundnut+Redgram	83228.55	10847126.92	10615801.55
26. Greengram+Redgram	12719.31	408289.85	1312378.40
27. Castor + Horsegram	760.39	30423.20	48832.25
28. Redgram+Phillipesara	138.25	6912.50	16574.79
Total:	601267.00	60983677.09	73848977.13

Table No. 5.21 (Contd.)

Stratum-3

Estimates of total cropped area, total output
total inputs, various types of incomes etc.,
(in Rs)

crop	Net profit (or loss)	Farm family labour income	Farm business income
	(5)	(6)	(7)
1. Irrigated Paddy:	-1280248.67	1568606.56	5397777.98
2. Jowar	-1825918.21	1413237.34	4940490.85
3. Variga	- 163052.62	3701.74	142957.48
4. Bajra	- 274213.17	- 53455.68	249941.40
5. Korra	- 155559.88	-108750.07	- 6777.18
6. Chillies	-1752529.14	-1286267.47	355665.17
7. Groundnut	-1035961.03	- 748432.68	-154162.21
8. Country tobacco	14330.03	36879.25	68097.01
9. Cotton	- 30233.31	-22705.39	- 14143.35
10. Greengram	-3576640.28	-2890198.33	- 1416530.48
11. Bengal gram	- 103524.25	- 68926.30	- 28621.94
12. Horsegram	- 27193.74	75928.04	192305.55
13. Vegetables	- 75570.18	-16590 .60	-12205.15
14. Castor	- 17 914.84	- 8432 .06	12240.93
15. Fodders	- 2972.42	152.08	3757.00
16. Jowar + Cucumber	- 1491588.26	-20682.71	3387097.64
17. Jowar +Redgram etc.,	192742.07	218891.35	241034.04
18. Jowar +Greengram	95642.48	107960.88	178738.45
19. Jowar +Greengram etc.,	-26943.04	-31456.81	252160.45
20. Bajra + Jowar	2300.48	4829.07	6301.44
21. Bajra + Redgram	-39219.65	-13891.67	-7454.61
22. Bajra + Cotton	1238.75	3208.19	5187.30
23. Korra + Redgram	-151876 .82	-108127.93	-37502.60
24. Korra + Cotton	-197609. 83	-126207.44	--44982.15
25. Groundnut	231375.37	118579 .14	4270456 .90
26. Greengram+Redgram	-904088.55	-662803.24	-157719 .44
27. Castor+Horsegram	- 18409.04	14584.28	18492.68
28. Redgram+Phillipesara	- 9662.29	-3230.90	- 3226.76
Total.	-12865300.04	-1593601.36	17839376.40

Stratum-3

Table No. 521 (Contd.)

Estimates of total cropped area, total output, total inputs, various types of incomes etc. (in Rs)

Crop	Farm investment income P.F.I.	Farm business EBI income Rent paid	Value added to materials		Estimated Land Revenue & cesses to Government
	(8)	(9)	Gross	Net	
Irrigated paddy	2548922.76	6449057.36	10291810.32	10018044.46	351756.44
Jowar	1701335.30	55559512.16	7570358.12	7247221.21	179087.93
Varigar	-23796.87	3164.10	494093.50	463069.43	13220.48
Bajra	29183.91	262366.24	444693.43	416376.37	19937.52
Korra	-53586.99	6777.18	35777.20	30182.09	7959.24
Chillies	-110596.50	399574.45	1223147.88	1159479.43	120476.09
Groundnut	-441690.56	69395.60	353081.20	307872.34	50859.97
Country Tobacco	45547.78	72859.86	97572.76	95222.44	1562.27
Cotton	-21671.26	-14143.35	31723.68	28256.28	4592.79
Greengram	-2102972.43	-1192742.47	-556295.72	-673744.75	64279.53
Bengalgram	-63219.89	48302.33	69690.15	63489.48	1842.23
Horsegram	89183.77	192695.42	222130.94	212773.95	6432.93
Vegetables	-71184.73	17497.55	29188.40	27391.08	188.03
Castor	2758.15	12240.93	35435.67	32992.73	2364.13
Fodders	632.50	7444.87	9473.72	9449.52	--
Jowar+Cucumber	9167192.09	3951613.92	5993118.89	5703560.97	132612.66
Jowar+Redgram	214884.76	241034.04	2982.90	291842.23	2825.90
Jowar+Greengram	166420.05	188738.45	208865.30	206264.75	851.64
Jowar+Greengram	14674.22	288086.99	379758.70	358506.38	8349.13
Bajra + Jowar	3772.84	6301.44	7070.11	7021.72	268.21
Bajra +Redgram	-32782.58	-3915.33	1924.48	-530.89	906.94
Bajra+Cotton	3217.87	5187.30	7766.43	7408.36	396.79
Korra+Redgram	-81251.48	-33048.08	-20256.88	-24611.86	3160.47
Korra+Cotton	-116384.54	-26894.45	9009.98	2303.30	7993.82
Groundnut+Redgram	3373253.13	439280.87	6560906.60	6416088.92	190593.33
Greengram+Redgram	-399004.75	-116381.69	45026.36	17171.07	13736.85
Castor + Horsegram	-14500.64	18492.68	19808.16	18918.50	425.82
Redgram + Pillipesara	-9658.15	3685.75	4104.64	4079.76	--
Total:	6567677.76	20960600.67	33867232.92	32446101.27	1186691.19

CHAPTER VI

ESTIMATE OF AGRICULTURAL OUTPUT IN THE PROJECT AREA
AFTER IRRIGATION

6.1 General.

In order to estimate the volume of agricultural output in the Project area after irrigation, we have to tackle a number of problems concerning changes in the extent of ayacut proposed to be irrigated, input-output coefficients in the case of wet crops and dry irrigated crops, cropping patterns, etc. The procedure adopted in estimating these things has to be more or less the same as we have adopted in the previous chapter. It is only when we have a reasonable forecast of future agricultural production in the region, we can have a firm basis for the measurement of direct and indirect benefits of the irrigation project.

6.2 Extent of the proposed ayacut.

According to the Joint Report of the Andhra and Hyderabad States on the Nandikonda Project (Nagarjunasagar Project), there is " a vast region of irrigable area of about 20 lakhs of acres under the command of the Nandikonda Right Bank Canal which is at present lying waste without development, owing to lack of irrigation facilities, although the Krishna river flows along the boundaries of the region ". This is of course a general description of the area of irrigation potential on the Right Bank Canal side of the Project covering both its first and second phases. Similarly, it was stated that " vast areas of land extending over a million acres " would get irrigation under the Left Bank Canal, besides providing additional water for an extent of over 3 lakhs of acres in the existing Krishna delta.

Taking the extent of ayacut proposed under the Right Bank Canal and the Left Bank Canal, it was assumed in the Joint Report that the total extent would be of the order of 3.2 million acres.

A brief reference may be made to the method adopted by the Joint Report to determine the net commanded area and the proposed ayacut. "The entire area (under the Right Bank Canal) is divided into a number of small blocks with important drains crossing the canal as their boundaries. The gross net commanded area is plani-metered from one-inch maps. High lands (obtained by interpolation between 50-ft. contours) not commanded by the main canal running half-full and river poranbokes are excluded. Of the net commanded area, 50% is taken as irrigable except in one block. The percentage has been fixed as a result of study of the data collected in the revenue investigations carried out earlier and an examination of the uplands of Guntur and Nellore". The Khosla Committee has also adopted this as reasonable. The Nandikonda Right Bank Canal serves to irrigate 17.8 lakhs of acres situated between Krishna and Pennar rivers including 1.1 lakhs of acres wet under Kavali canal and drops sufficient water into Pennar to irrigate 0.78 lakhs wet under Kanupur canal on the right bank of the Pennar river. Of 17.8 lakhs excluding 1.1 lakhs wet under Kavali canal it is proposed to permit $\frac{1}{3}$ wet and $\frac{2}{3}$ dry. The big block of 17.8 lakhs will include portions of areas proposed under the earlier schemes like Puvlichintala, Krishna-Pennar, etc. Details of the ayacut are given in the following table No. 6.1.

Table No. 6.1

Details of the ayacut according to Joint Report

Description	Gross area (lakhs of acres)	Uncomm- anded area & (lakhs of acres)	Net comm- anded area (lakhs of acres)	Ayacut (lakhs of acres)
(1)	(2)	(3)	(4)	(5)
1. Nandikonda Right Bank Canal	32.83	3.41	29.42	14.71
2. Nandikonda Pu- lichintala Block	7.64	0.28	7.36	2.0
3. Kavali Canal	1.57	1.1
4. Kanpur Canal	1.14	0.78
Total	40.47	3.69	39.49	18.59

(Vide Joint Report pp. 32-33)

As regards the area under the Left Bank Canal, the determination of net commanded area and the ayacut is referred to as follows:

" The gross area commanded by the canal upto ^{to} Kakileru stream is 14,41,000 acres. Of this 1,03,000 acres are high lands and 53,000 acres are being irrigated by the existing sources. The net area commanded is thus 12,80,000 acres. Of this, 9,87,000 acres is in Hyderabad state and 2,93,000 acres in the Nandigana taluk of Andhra State...Of the net commanded area of 12,80,000 acres, it is proposed to irrigate 70% of it i.e. 8,95,000 acres. Another 1,23,000 acres i.e. 10% of the area is provided under forest, fuel and pasture. These will be inferior lands not suited for intensive irrigation. There will thus remain 20% of the area for communal needs such as village sites, roads, railway lines, cart-tracks, nallas

and stream-belts, dry belt round the villages, etc".

We, are, however, not concerned with the comprehensive proposals made in the Joint Report for irrigation of the arid lands under the Nagarjuna-sagar Project lying in the districts of Guntur, Kurnool and Nellore on the right side and Nalgonda, Khannan, Krishna and West Godavari districts on the left side, involving ultimately utilisation of about 464,000 million c.ft. of Krishna waters. The project sanctioned by the Government of India as the First Phase of the Project is restricted in its scope and will cover only some parts of the Guntur district and the Markapur taluk of the Kurnool district under the Right Canal side, and Miriyalaguda and Huzurnagar taluks of Nalgonda district, Khannan taluk of Khannan district, and Nandigana and Jaggayyapet taluks of Krishna district on the Left Canal side. We are therefore concerned with the ayacut proposed under the first phase of the Nagarjunasagar Project, the extent of which, according to the Project Authorities, was originally 9.7 lakhs acres under the Right Bank Canal, 7.9 lakhs acres under the Left Bank Canal and 3 lakhs acres as additional ayacut under the existing Krishna delta area, amounting to a total of 20.6 lakhs of acres. The final position which is communicated to us by the Project authorities and which we have accepted, is as follows.

Table No. 6.2
Final position of the ayacut (Acres in lakhs)

Item	Right Bank Canal	Left Bank Canal	Additional Ayacut in Krishna	Total
(1)	(2)	(3)	(4)	(5)
1. Wet ayacut	3.85	1.70 (Andhra) 4.80 (Telan- gana)	3.00	13.35
2. <u>Dry irrigated</u>				
(i) Kharif	3.67	0.40 (Andhra) 1.10 (Telan- gana)		5.17
(ii) Rabi or Kharif	3.72	...		3.72
Total	11.24	8.00	3.00	22.24

We may now raise the question whether an irrigable area of 11.24 lakhs of acres and 8.00 lakhs of acres under the Right and Left Bank Canals respectively, is actually available and how it compares with our previous estimates of the area actually cultivated and the extent of grazing land, culturable waste and other fallows available for cultivation in the ayacut villages and towns. We have estimated the extent of grazing land, culturable wastes etc. depending on the information collected in our Census Survey of sample villages and in our village schedules. The method of estimation followed is that the extent of grazing land, or culturable waste or other fallows in each stratum of the Project area constitutes the same proportion in the total cultivated area of the stratum, as the proportion of such lands constitute in the total cultivated area of the sample villages. It is also assumed that the extent of such lands in villages with more than 5,000 population, uninhabited villages and towns not

included in the frame used for our sample surveys, bears the same proportion in the total cultivated area of these villages and towns. It may be seen from the following table No. 6.3 that the total extent of the land cultivated at present together with grazing land, culturable waste and other fallows, comes to 13.6 lakhs acres under the Right Bank Canal and 8.2 lakhs acres under the Left Bank Canal. This may be considered as the net culturable commanded area of the Project.

Table No. 6.3
Details of Irrigable area (in acres)

Items	Right Bank Canal side			Left Bank	Total
	S ₁	S ₂	Total	Canal side S ₃	
<u>1. Villages in the frame</u>					
i) Cultivated area	5,13,504	5,86,343	10,99,847	5,92,946	16,92,793
ii) Grazing land	36,972	63,325	1,00,297	1,01,394	2,01,691
iii) Culturable waste, fallows, etc.	12,273	26,620	38,893	36,214	1,25,107
<u>2. Towns, villages with more than 5,000 population and uninhabited villages</u>					
i) Cultivated area	65,978	45,582	1,11,560	29,817	1,41,377
ii) Grazing land	4,750	4,923	9,673	5,099	14,772
iii) Culturable waste, forests, fallows, etc.	1,577	2,069	3,646	4,335	7,981
Total	6,35,054	7,23,862	13,63,916	8,19,805	21,83,721

We find that our estimate of the total area actually cultivated plus grazing land, etc., coming to 3.2 lakhs acres in stratum-3 (under the Left Bank Canal) compares favourably with the estimate of 3.95 lakhs acres of irrigable area, as given in the Joint Report, of which an extent of 3.00 lakhs is the proposed ayacut. Similarly, our estimate of 13.6 lakh acres of the total of cultivated area, and grazing land, etc., in S_1 and S_2 (under the Right Bank Canal) does not compare unfavourably with the extent of ayacut proposed equal to 11.24 lakhs acres, if we make due allowance for an extent of 67,000 acres under virginia tobacco at present for which water will not be given, for lands that will go under canals, distributaries and field channels, and for areas proposed to be left out as anti-malarial zones around villages, etc. The extent of irrigable area in the first phase under the Right Bank Canal as different from the actual extent of proposed ayacut is not shown in the Official Reports. This will be in any case more than the extent of proposed ayacut. It may be also mentioned in this connection that the method adopted in the Joint Report for the determination of net commanded area and irrigable area is subject to greater error than the methods we have adopted. It is also not clear from the Official Reports to what extent deductions were made on account of land for raising virginia tobacco and for non-agricultural uses from the total estimated net commanded area.

For the purpose of estimating agricultural output in the Project region after irrigation, we have, however, accepted the extents of ayacut proposed and communicated to us by the Project Authorities.

6.3 Cropping pattern after irrigation.

Full details of the existing pattern of cropping in the three strata of the Project area have already been given in the previous chapter. In what respects this pattern is going to change after the area is brought under irrigation can only be determined in the light of (i) Government's policy regarding supply of water for wet crops, dry crops, etc.; (ii) the extent to which water will be made available during the Kharif and Rabi seasons; (iii) suitability of soils for wet and dry crops; and (iv) the cultivators' estimate of relative profitability of different wet and dry irrigated crops, their experience in raising wet crops, and incentives provided to adopt changes in the patterns of cropping. Some of these factors are ~~int~~ intangible and some cannot be precisely determined. It is therefore difficult to give an exact estimate of the cropping pattern that is likely to emerge after the ayacut is developed under irrigated conditions. So far as Government's policy regarding supply of water for wet crops and irrigation of dry crops is concerned, it is definitely known that they have proposed to restrict intensive all-wet irrigation with a view to protect as large an area as possible against precarious and uncertain rainfall. It is for this reason that the general

pattern of localisation of partly wet and partly dry has been adopted subject to variations in soil conditions and engineering or other factors. Specifically, the formula of $\frac{1}{3}$ wet and $\frac{2}{3}$ dry has been adopted for the ayacut under the Right Bank Canal and maximum possible wet for the ayacut under the Left Bank Canal.¹

Localisation of a dry-cum-wet irrigation pattern of cropping raises complicated questions concerning the alignment of canals and distribut^aories, discharge

1. The following remarks made in the Techno-Economic Survey of Andhra Pradesh (pp. 36-37) regarding the relative merits of wet farming and dry irrigated farming are worth noting:-

"Where the supply of water from the project falls short of the demand of the area it can command, dry irrigated farming is more productive and economical to the society and more profitable to the farmers than pure wet farming. The comparison of gross out-turn and net profit per acre in dry irrigated farms and wet farms is not justifiable for this purpose.... The superiority of dry irrigated systems over wet and their economic potential would be still more conspicuous when the possibilities of developing double cropping are considered. In the entire dry irrigated area another minor crop, either of pulses or of green manure, can be grown either before or after the main crop. In the Tungabhadra area, although water is supplied only to the main crop, cultivators found it possible to raise Bengalgram after nungari jonna, redgram mixed with groundnut, green manure (Sunhemp) before Combodia cotton or Glumed wheat. At certain places groundnut is grown

of water into the canals, the suitability of soils, the need for irrigation of dry crops in the Kharif season taking into account the quantity and distribution of rainfall received during the season, storage of water in the reservoir to supply water in the Rabi season, etc. As regards the question of alignments of different channels and distributories and the extents of different crops to be irrigated in different reaches of the main canal, the Annual Report of the working of the Project observed as follows:

by the cultivators twice in both the seasons. Apart from these the ryots have a choice between many alternative crops of high value in small areas like tobacco, vegetables, sweet potatoes, tomatoes, onions, maize, etc., and fruit crops like Papaya, Pomegranates, Sapotees, Guavas, etc. The difference in these two systems is that while such double cropping is possible in the entire area in the dry irrigated zone it is limited only to one-third of the area in the wet (assuming 1 cusec discharge of water commands 50 acres of wet or 160 acres of dry irrigated). If these factors are taken into account both the total outturn and net profits of the farm would be much more in dry irrigated zones than in the wet ones. Besides this superiority in the economic sense, the dry irrigated farming has an advantage of better utilizing family labour, doing away with the seasonal nature of employment and also of distributing the benefits to a large number of families. It thus provides the necessary environment to make agriculture more labour intensive".

"It has been proposed to provide irrigation facilities for instance, under the Right Canal, on the basis of $\frac{1}{3}$ rd wet and $\frac{2}{3}$ rd dry, the canal running from June to December. A suggestion was, however, made that the ayacut should be split into two areas, one having kharif crop and the other rabi crop. The area under the rabi crop will be different from the area covered by the kharif crop. The advantage of this proposal is that a smaller canal can supply the whole ayacut and the total supply will be spread over a longer period, i.e., for one area from June to October-November and the other area from September-October to February or so. In effect, it has been suggested that the entire ayacut should be split up into $\frac{1}{3}$ kharif wet, $\frac{1}{3}$ rd kharif dry and $\frac{1}{3}$ rd rabi dry.

The Development Committee examined in great detail the alternative cropping pattern and particularly the possibility of a paddy crop being successful if sown as late as September-October. The Committee considered that in the light of the experiments already conducted at the Research Stations of Samalkot, Marateru, Buchireddipalem and Siruguppa, the division of the irrigated dry and wet crop ayacut into kharif and rabi blocks was not practicable. Even were this possible, one serious objection was that it would result in a permanent fixation of the cropping patterns without any option to the ryots to vary to the crops to their best advantage".

It is generally held that in the tracts under the Right Bank Canal where black cotton soil predominates, water is not required in the kharif season except when rain ^{fails} ~~falls~~ for prolonged periods.

Experience of dry irrigation in the Tungabhadra area has also shown that dry irrigation in the first crop season has not become a firm practice because black cotton soils are retentive of moisture and do not require artificial irrigation during kharif season of normal rainfall. It means, if irrigation is to be confined under the Right Bank Canal to the 1st crop season only, and water is not available during the Rabi season, dry irrigated blocks may have to be localised primarily in the red soil tracts without rigidly ~~adhering~~ adhering to the $\frac{1}{3}$ -wet and $\frac{2}{3}$ rd dry formula for localisation. If adequate water can be made available for supply during the Rabi Season, black cotton soil tracts as well as red soil tracts may be localised for dry irrigation.

It has not been possible to go more thoroughly into these technical questions which continue to be controversial. We have therefore accepted the general pattern of localisation tentatively accepted by the Project authorities as given in an earlier table. According to this pattern it is proposed to have under the Right Bank Canal 3.35 lakhs of acres for wet crops, 3.67 lakhs for dry irrigation during the kharif season and 3.12 lakhs for dry irrigation either during the Rabi or Kharif season. The total extent of ayacut under the Right Bank Canal is thus fixed at 11.24 lakhs of acres. Under the Left Bank Canal it is proposed to have 6.5 lakhs of acres for wet crops and 1.5 lakhs acres for dry irrigation during the kharif season, the total extent of proposed ayacut being 8.00 lakhs acres.

We may now proceed to consider the distribution of the proposed ayacut under various crops which are suited to the soils and which are likely to be raised after irrigation in the three strata S_1 , S_2 and S_3 of the project area. The following considerations are taken into account in this respect ^{Fully.} It is assumed that the soils prevalent in the three strata are suitable for raising wet paddy as well as other crops under conditions of dry irrigation; Secondly, it is assumed that no part of the proposed ayacut under the Right Bank Canal will be devoted to raising virginia tobacco; Thirdly, in the balance of ayacut remaining after allocation to irrigated paddy, important dry crops both commercial and food crops, will continue to be raised. There is however likely to occur considerable reduction in the diversity of the existing cropping pattern. When water is supplied, there is ~~fm~~ bound to be a lessening of risks and uncertainties facing the cultivators at present. The enormous variety of crops and crop mixtures grown at present is then likely to diminish and a few of the more profitable dry crops like chillies, groundnut, country tobacco, jowar and ragi are likely to be substituted for others; and lastly, these changes which are likely to occur, will bring about a major shift in the cropping pattern in the Project area. Not only there will be a great increase in the acreage under paddy and reduction in the acreage under other crops, but also the pattern of other crops will be radically different. The Joint Report on the Nandikonda Project (or other reports of the Project authorities) does not however throw much light on this particular aspect, namely, the allocation of ayacut under the various crops other than paddy. It is possible to make allocations on

an ad-hoc basis making marginal adjustments to the existing extents under these crops, but the latter will not be of much help in this respect because of the considerable reduction in the total area of the ayacut remaining for these crops after allocation to irrigated paddy.

6.4 Cropping pattern suggested by the Department of Agriculture.

The Department of Agriculture of the Government of Andhra Pradesh however suggested a tentative breakdown of the proposed ayacut under different crops, as shown in the following table No. 6.4.

Table No. 6.4
Crop pattern suggested by the Department of Agriculture

Crop	Area in lakhs of acres		Total
	Right Canal	Left Canal	
(1)	(2)	(3)	(4)
1. Paddy (Wet)	3.85	6.76	10.61
2. Paddy (Irr. Dry)	0.60	-	0.60
3. Cotton	3.00	0.14	3.14
4. Groundnut	2.00	0.35	2.35
5. Chillies	0.50	-	0.50
6. Jowar	0.36	0.10	0.46
7. Maize	0.54	0.15	0.69
8. Ragi	0.39	-	0.39
9. Sugarcane	-	0.15	0.15
10. Garden Crops like turmeric, banana and vegetables	-	0.25	0.25
Total	11.24	7.90	19.14

The Agricultural Department also made some suggestions regarding the possibilities of raising a

second crop in the irrigated wet paddy fields following the kharif season, and similarly a second crop in the fields under dry irrigation either in the Kharif or rabi season. There is always a possibility of raising crops like fodder, jowar, pillipesara and Sunhemp in the rice follows if short duration varieties of paddy are grown in the Kharif season. Such crops can also be grown in shallow black soils following groundnut, cotton or jowar raised in the Kharif season, or under rain-fed conditions in the Kharif season followed by irrigated crops like cotton, groundnut, chillies and jowar during the rabi season if water is made available. It is not however clear from the account given by the Agricultural^e Department whether the relative profitability of the different crops other than wet paddy under conditions of dry irrigation is taken into account. A high proportion of the ayacut proposed for dry irrigation i.e., 5 lakhs out of 7.39 lakhs of acres is allocated to the two crops i.e., cotton and groundnut, (3 lakhs of acres for cotton and 2 lakhs of acres for groundnut). It is doubtful if the Department of Agriculture has paid adequate attention to the yields, prices and profitability of these two crops in relation to others, in allocating such a high proportion of the ayacut to them. We have however attempted to calculate the gross value of output and value added to material costs for the Right Bank Canal and Left Bank Canal region, on the basis of the cropping patterns suggested by the Department of Agriculture. The calculations are given in the following table No. 6.5.

Table No. 6.5

Value of output and value added as per the Crop pattern suggested by the Department of Agriculture

Crop	Right Canal			Left Canal		
	Acreage Acres Lakhs	Value of output Rs. lakhs	Value added Rs. lakhs	Acreage Acres Lakhs	Value of output Rs. Lakhs	Value added Rs. Lakhs
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Paddy (Wet)	3.35	1385.54	1050.43	6.76	2399.80	1863.87
2. Black Paddy	0.60	113.83	73.21	-	-	-
3. Cotton	3.00	404.01	266.67	0.14	16.67	11.17
4. Groundnut	2.00	435.96	299.28	0.35	69.77	47.15
5. Chillies	0.50	724.36	648.16	-	-	-
6. Jowar	0.36	62.32	42.30	0.10	17.31	11.75
7. Maize	0.54	93.43	63.45	0.15	25.97	17.63
8. Ragi	0.39	100.92	74.43	-	-	-
9. Sugarcane	-	-	-	0.15	84.00	46.50
10. Garden crops like Vegetables, etc.	-	-	-	0.25	30.97	9.16
Total	11.24	3320.47	2517.98	7.90	2644.49	2007.23

It may be seen that the value of gross output comes to Rs. 3320.5 lakhs for the Right Bank Canal area (nearly Rs. 300 per acre) and Rs. 2,644.5 lakhs for the Left Bank Canal area (nearly Rs. 340 per acre). When the cropping pattern is arbitrarily determined as the Department of Agriculture seems to have done, it will be difficult to say whether such cropping pattern is optimal or not, and whether it gives maximum benefit to the community. If at least two or three alternative cropping patterns have been studied by the Department of Agriculture, on the basis of the input-output requirements assumed for irrigated crops, the Department's method could be considered as a kind of restricted Farm Planning and Budgeting for the region as a whole. An alternative cropping pattern, for instance, which allocates more land to groundnut than cotton might perhaps, give a higher agricultural output in the region, if we take into account the relative crop yields and prices of the two crops. Hence, instead of depending on such cropping patterns arbitrarily determined, we have considered it useful to adopt another method which is more reliable and scientific to determine the optimal cropping pattern under conditions of irrigation, given the assumptions about crop yields, prices and input requirements. This is the method of Linear programming; ~~and~~ its nature and how it is applied in our case are fully explained in Chapter IV of volume II. It suffices here to point out its essential features, the assumptions we have made regarding the availability of resources to typical holdings, the input requirements of crops, etc., and to describe the optimal cropping pattern finally arrived at.

Linear programming represents a systematic method of determining mathematically the optimum plan for the selection and combination of farm enterprises with a view to maximise the income of an individual farm or group of farms within the limits of available resources. The four important assumptions upon which the linear programming technique is based may be stated as:- (i) a constant input-output ratio or transformation co-efficient can be used irrespective of the scale of operation; (ii) both farm resources and farm enterprises are divisible and additive in order to achieve the goal of maximisation; (iii) that each farm enterprise is independent of the other enterprises, and the selection of one does not necessitate the selection of any other; and (iv) that a finite number of enterprises is adopted so that the selection and combination of enterprises can be made only within the finite number of enterprises. The various types of information required regarding crop yields, prices, etc. in order to apply the linear programming technique, are the same types of information which are required for a flexible method of Farm Planning and Budgeting. But, while the latter method required the preparation of an undetermined number of alternative plans and budgets in order to determine the best one, the method of linear programming is quite straight-forward and systematic. It may be also observed in this connection that the assumption of linear production function may be considered to hold good under the farm conditions prevailing in India, since the possible range of variation of the scale of operation of a

given farm is relatively small due to the limited availability of land and other resource². Further, in the application of linear programming technique for the choice of a combination of enterprises yielding maximum returns, the set of restrictions taken into account may relate not only to the quantities and qualities of the input resources available such as land, labour and capital, but may also relate to various other considerations such as (i) the preference of farmers to grow food crops upto a certain extent irrespective of their profitability, (ii) provision of employment opportunities for the members of the farm family irrespective of productivity considerations, and (iii) preference for a relatively more diversified crop pattern or for adoption of crop mixtures, crop rotations, other cultural practices, etc.

6.6 Assumptions made in Programming for the Project area.

In the light of the above considerations, we have made the following assumptions for the purpose of programming for the Right Bank Canal area and Left Bank Canal area separately. (i) Programming is done

2 See the article on "Methods of Econometric Analysis--Linear Programming" by Dr. S.C. Hsieh, published ~~in~~ ⁱⁿ "Farm Management", (Proceedings of the Development Centre on Farm Management held at Manila, Phillipines in October 1960, under the joint auspices of the F.A.O. and the Government of Phillipines) for an illuminating discussion of the applicability and limitations of linear programming to farm management studies under Asian conditions. See also "Methods of Farm Management Investigations", by W.Y. Yang; F.A.O., Rome, 1958.

for typical or representative individual holdings instead of for each region as a whole and the results of programming for typical holdings are pooled to determine the regional cropping pattern.

(ii) Four typical holdings have been selected for both the Right and Left Bank Canal areas, (iii) Programming is done for each holding to determine the optimal cropping pattern which gives the maximum value-added to material inputs, because this helps in determining the benefit received by the community after irrigation, (iv) In each holding, we have made an ad-hoc allocation of the land resource to irrigated paddy to the full extent that Government has decided to give water for wet crops, because the individual cultivator is expected to give highest priority to paddy in the use of his limited resources, (v) We have similarly made ad-hoc allocations to certain other crops such as chillies, country tobacco and vegetables, as they become highly profitable crops under conditions of irrigation requiring high levels of inputs per acre, and as they are not likely to be raised on too extensive an area in view of limitation of resources and other considerations, (vi) It is also assumed that (a) human labour, (b) bullock labour and (c) ~~(d)~~ other variable inputs consisting of seed, manures and fertilisers etc., are limitational factors. However, human labour is not treated as a limitational factor in programming for the Right Bank Canal area. ^{vii} ~~(vii)~~ Finally, additional resources are assumed to become available both as a result of their natural rates of growth and as a result of Government's policy; and additions are made

on an ad-hoc basis such that the resources assumed available after irrigation will be sufficient to ensure full utilisation of the land resource remaining after allowing for the ad-hoc allocations to paddy, chillies and other crops mentioned above.

We may now proceed to describe the procedure we have adopted for programming and the optimal cropping patterns arrived at for the Right and Left Bank Canal areas separately.

6.7 Programming for the Right Bank Canal Area.

(a) General.

The estimated area under cultivation at present in S_1 and S_2 taken together comes to 12.1 lakhs of acres. In addition to this, there is an area of 1.53 lakhs of acres in this region which is cultivable but not cultivated at present. We may assume that this additional extent of cultivable land makes adequate allowance for lands which will not be brought under cultivation as they will be required to be left for cattle grazing, as ~~x~~ lands that will go ~~and~~ under canals, distributories and field channels, and as lands around villages proposed to be left out from cultivation as anti-malarial zones, etc. The total extent of cultivated area may thus be expected to remain the same as at present. Water will not however be available for irrigating this entire extent, because Government has proposed to supply water to an extent of 11.24 lakhs of acres only; $\frac{1}{3}$ of which will be for wet crops and $\frac{2}{3}$ for dry irrigation. For the purpose of estimating the optimal crop pattern by

linear programming method, we have accepted this figure as final, and assumed that the balance of 87,000 acres will remain under unirrigated crops including the existing area under virginia tobacco.

In programming for the optimal crop pattern for 11.24 lakhs of acres, we may adopt two alternative methods. One method is to take the entire extent of land and the total of human labour, bullock labour and other resources available for the whole area, select certain activities or crops and then determine the optimal crop pattern for the region as a whole. This constitutes an aggregative approach in applying the linear programming technique. The alternative method is first to distribute the total extent of 11.24 lakhs of acres into a certain number of size-groups of holdings, choose the typical size of holding in each of the size groups, and then programme for the typical individual holding in each of these size groups. The optimal cropping patterns thus arrived at for the typical holdings and for the total extents in the different size-groups may then be pooled to give the optimal crop pattern for the region as a whole. The main advantage of the second method lies in its being more realistic and being of practical significance, as programming is done for individual holdings of different sizes taking into account their resources. We have therefore adopted this method.

In distributing the total of 11.24 lakhs of acres under certain size-groups of holdings, we have taken into account only four size-groups instead of

the 12 size-groups of holdings adopted in the study of distribution of holdings in our Census Survey. We have not found it necessary to adopt a large number of size-groups for purposes of programming. We have also assumed that the percentage distribution of holdings according to size is the same as that which is obtained in our Census Survey. As regards the size of the typical holdings in each size-group we have assumed for convenience the same average size as obtained in our Census Survey, ~~xxxx~~ instead of assuming a different size arbitrarily. The relevant details are given in the following table No. 6.6.

Table No. 6.6

Distribution of 11.24 lakhs acres among the 4 size-groups and the sizes of typical holdings.

Size groups (in acres)	Total extent (in acres)	Size of typical holding or Average size (in acres)
(1)	(2)	(3)
0,01 - 2.50	59,572.00	1.26
2,51 - 7.50	2,26,710.00	4.83
7.51 - 15.00	3,34,390.80	10.65
Above 15.00	5,03,327.20	24.81
Total	11,24,000.00	

It is further assumed that on a part of the holdings localised for wet crops, irrigated paddy will be raised as a matter of first priority, i.e. to an extent of $\frac{1}{3}$ of the typical holdings under the Right Bank Canal. We have also found it necessary to make ad-hoc allocations to two crops, namely, chillies and country tobacco,

because they will be highly profitable crops under dry irrigated conditions and require high levels of inputs per acre. They are not likely to be raised on too extensive an area partly on account of preference to food crops and partly on account of a limitation of available resources. Accordingly, certain extents are set apart in each typical holding for these two crops, the total of such extents being 1.5 lakhs of acres for chillies, and 1.00 lakh acres for country tobacco. After making allocations in this manner to irrigated paddy, chillies and country tobacco in the typical holding and also setting apart the resources required for these three crops, an attempt is made to determine the optimal cropping pattern for the remainder of the area.

Table No. 6.7

Ad-hoc allocations made for specific crops (in acres)

Size-groups (acres)	Average size of holding	Allocations made for			Ba- lance
		(Irr.)Paddy	Chillies	Country tobacco	
(1)	(2)	(3)	(4)	(5)	(6)
0.01 - 2.50	1.26	0.42	0.17	0.11	0.56
2.51 - 7.50	4.83	1.61	0.64	0.43	2.15
7.50 -15.00	10.65	3.55	1.42	0.95	4.73
Above 15.00	24.81	8.27	3.31	2.21	11.02

(b) Resources.

The resources required for crop production are classified into four categories; (I) land (II) human labour (III) bullock labour and (IV) other variable inputs consisting of value of seed, manures and fertilisers, hire charges for implements, etc. Information about the availability of these resources for

each of the four size-groups of holdings is obtained from our Census Survey of the sample villages and Farm Surveys. On the basis of this information we have found that human labour will not be a limitational factor, but bullock labour and other variable inputs at their existing levels of supply will not be adequate for full utilisation of the land resource under irrigated ~~xxx~~ conditions. We have therefore assumed that 50% more of bullock labour than existing at present will become available partly due to natural growth in the stock of work-animals over a period of 10-15 years and partly due to Governmental or private programmes to improve the position in regard to supply of bullock-labour in the region. As regards other variable inputs, we have assumed, that 40 to 125 per cent more will be made available by private or official credit agencies for the typical holdings. From the amounts of these two resources thus assumed to become available after irrigation, the requirements of crops for which ad-hoc allocations of land resource are made, are deducted and the remainder of the resources are taken into account for purposes of programming. The details are given in the following tables Nos. 6.8, 6.9 and 6.10.

Table No. 6.8

June/July bullock labour (in 8 hr. bullock pair days)

Size-group (acres)	Assumed availability	Set apart for Paddy (Irr.)	Balance
0.01 -2.50	2.84	1.68	1.16
2.51 -7.50	15.21	6.44	8.77
7.51-15.00	28.76	14.20	14.56
Above 15.00	66.99	33.08	33.91

Table No. 6.9

September/October bullock labour (in 8 hr. bullock pair days)

Size-group (acres)	Assumed availa- bility	Set apart for		Balance
		Chillies	Country tobacco	
(1)	(2)	(3)	(4)	(5)
0.01 - 2.50	2.84	0.66	0.44	1.74
2.51 - 7.50	15.21	2.24	1.72	11.25
7.51 -15.00	28.76	4.97	3.80	19.99
Above 15.00	66.99	11.59	8.84	46.56

Table No. 6.10

Other variable inputs (in Rs.)

Size-group (acres)	Assumed availa- bility	Set apart for			Balance available
		Chillies	Country tobacco	Paddy	
(1)	(2)	(3)	(4)	(5)	(6)
0.01 - 2.50	64.82	20.40	6.00	21.50	16.32
2.51 - 7.50	245.34	76.80	25.80	82.50	60.24
7.51 -15.00	449.59	170.40	57.00	132.50	89.69
Above 15.00	1385.73	397.20	132.60	425.00	430.93

(c) Input-Output data for crops (under irrigated conditions).

It is common knowledge that the input requirements and yields of irrigated crops will be considerably different and also higher than those of unirrigated crops. It is therefore necessary to have reasonably dependable input-output data for crops under irrigation before programming is undertaken. The details of input requirements, yields, etc., for irrigated crops as assumed by us are given in the following table No 6.11. These are based on the information available in Farm Management Studies in Andhra Pradesh, Madras, Madhya Pradesh and Punjab; Season and crop Reports of Andhra

Pradesh, Crop-cutting experiments conducted by the Bureau of Economics & Statistics of the Government of Andhra Pradesh; Techno-Economic Survey of Andhra Pradesh; and the Farm Surveys conducted by us. It may be mentioned in this connection that the physical inputs and outputs and by-product of different crops are valued at their respective average prices prevailing in the year 1959-60, which we have used in estimating the total agricultural input of the region before irrigation.

RIGHT CANAL AREA (S₁+S₂)

Table No. 6.11

PER ACRE INPUT REQUIREMENTS AND VALUES OF OUTPUT (INCLUDING VALUE OF BY-PRODUCT) ASSUMED AFTER IRRIGATION

S.No.	Name of crop	8 hr. man-days	8 hr. bullock-pair days required			Value of Value @ Rs. 4.63 per 8 hr. bullock pair day (in Rs.)	Value of other variable inputs (in Rs.)	Value of material inputs (in Rs.)	Yield		Value (in Rs.)	Value of by-product (in Rs.)	Value of total output @ 59-60 pps (in Rs.)	Gross value added (in Rs.)
			June/July	Sept/Octo	Total				Weight (in mds.)	Price per mdg. (in Rs.)				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1.	Paddy	50	4	-	8	37.04	50	87.04	24.00	13.12	314.88	45.00	359.88	272.84
2.	Black Paddy	37	3	-	6	27.78	40	67.78	14.00	11.70	163.80	26.00	189.80	122.02
3.	Ragi	50	-	3	6	27.78	40	67.78	16.00	13.36	213.76	45.00	258.76	190.98
4.	Jowar	25	3.5	-	7	32.41	30	62.41	12.00	13.86	166.32	60.74	227.06	164.65
5.	Variga	25	4	-	8	37.04	45	82.04	12.00	12.03	144.34	28.07	172.24	90.20
6.	Bajra	30	2	-	4	18.52	20	38.52	9.00	13.63	122.67	25.00	147.67	109.15
7.	Korra	25	2	-	4	18.52	20	38.52	12.00	10.16	121.89	25.00	146.80	108.28
8.	Varagulu	22	3	-	6	27.78	10	37.78	12.00	8.73	104.76	30.00	134.70	96.99
9.	Coriander	20	3	-	6	27.78	35	62.78	6.00	27.79	166.74	5.81	172.55	109.77
10.	Chillies	60	-	3.5	7	32.41	120	152.41	1600 lbs	74.42	1446.72	2.00	1448.72	1296.31
11.	Country tobacco	30	-	4	8	37.04	60	97.04	6.00	39.73	238.38	-	238.38	141.34
12.	Cotton	30	3	-	6	27.78	18	45.78	400 lbs	27.71	1108.80	-	1108.80	88.89
13.	Groundnut	50	2	-	4	18.52	50	68.52	11.00	19.18	210.98	7.00	217.98	149.46
14.	Castor	15	2.5	-	5	23.15	10	33.15	4.00	15.68	62.72	-	62.72	29.57
15.	Gingelly	15	2	-	4	18.52	10	28.52	5.00	30.94	154.70	-	154.70	126.18
16.	Fodders	21	-	-	2	9.26	11	20.26	-	-	-	-	39.67	19.41
17.	Vegetables	70	-	-	2	9.26	78	87.26	-	-	-	-	128.88	36.62
18.	Jowar+Redgram	37	2	-	4	18.52	10	28.52	-	-	149.90	37.24	187.14	153.62
19.	Other mixtures	28	2.5	-	5	23.15	16	39.15	-	-	121.56	27.00	148.56	109.41

(d) Results of Programming.

After a consideration of the input-output relationship for 14 important crops and crop mixtures, and elimination of inefficient ones, programming is done with the object of maximising the value-added to material costs in crop production. The optimal crop-pattern is then determined by the simplex method. The results of programming done in this manner are shown in the following table Nos. 6.12 and 6.13 for the typical holdings and for the region under the Right Bank Canal as a whole.

Table No. 6.12

Optimal crop-pattern for individual farmers of different size-groups

(Right Canal Area) (in acres)

Size-group (in acres)	Average size	Areas allocated to			Areas as determined by programming	
		Chillies	Country tobacco	Paddy	Ragi-II	Jowar+Redgram
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.01 - 2.50	1.26	0.17	0.11	0.42	0.36	0.20
2.51 - 7.50	4.83	0.64	0.43	1.61	1.29	0.86
7.51 - 15.00	10.65	1.42	0.95	3.55	1.41	3.32
Above 15.00	24.81	3.31	2.21	8.27	10.69	0.33

Table No. 6.13

OPTIMAL CROP PATTERN OBTAINED FOR 11.24 LAKHS OF ACRES (RIGHT CANAL AREA)

(Figures in acres)

Size-group (in acres)	Total acreage	Chillies	Country tobacco	Paddy	Ragi-II	Jowar+redgram
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.01 - 2.50	59,572.00	7,950.00	5,300.00	19,853.61	17,014.07	9,454.32
2.51 - 7.50	2,26,710.00	30,255.00	20,170.00	75,485.58	60,483.66	40,316.56
7.51 - 15.00	3,34,390.80	44,625.00	29,750.00	1,11,468.43	44,280.55	1,04,266.02
Above 15.00	5,03,327.20	67,170.00	44,780.00	1,67,783.41	2,16,901.24	6,692.55
Total	11,24,000.00	1,50,000.00	1,00,000.00	3,74,591.03	3,38,679.52	1,60,729.45

It may be seen from the above tables that ragi (Second crop) and jowar + redgram mixture are the only two crops which have come into the optimal crop pattern. These two crops occupy the first and second places among the efficient crops when arranged in the descending order of the value added. The value added to material costs amount to Rs.190.93 for ragi (second crop), and Rs.153.62 for jowar+redgram. Among the other crops, the value-added per acre is also high for groundnut, being Rs.149.64, and it is likely to compete with jowar + redgram in the actual choice of crop pattern by the farmers, although it has not come out in the pattern arrived at by programming. For the same reason, oil seeds other than groundnut, and jowar or bajra mixed with pulses, may also compete with the above crops.

6.8 Programming for the Left Bank Canal Area.

(a) General.

On the Left Bank Canal side, the total extent of proposed ayacut is 8.00 lakhs of acres. It is divided into four size-groups of holdings, as we have done in the case of the Right Bank Canal area. The distribution of the acreage of 8.00 lakh acres under the four size-groups of holdings is given below.

Table No. 6.14

Distribution of 8.00 lakh acres among the 4 size-
groups and the sizes of typical holdings (in acres)

Size-group (acres)	Ayacut	Typical holding or average size
0.01 - 2.50	24,160	1.47
2.51 - 7.50	1,47,200	5.00
7.51 - 1500	2,07,360	10.69
Above 1500	4,21,280	27.62
Total	8,00,000	

In programming for each of the above four typical holdings, we have adopted the same procedures as in the case of Right Bank Canal area. 6.5 / 8, part of each holding is allotted for irrigated paddy, as the Government proposed to supply water for wet crops to an extent of 6.5 lakhs of acres out of 8.0 lakhs of acres. In addition, we have found it necessary to make ad-hoc allocations to chillies, vegetables and country tobacco on the Left Bank Canal area, the total allocations being 10,000 acres for chillies, 10,000 acres for vegetables and 5,000 acres for country tobacco. The breakdown of these allocations in the various size groups is done in the same way as for the Right Bank Canal area. Details may be seen in the following table No. 6.15.

Table No. 6.15

Allocations made for specific crops (in acres)

Size-group (acres)	Average size of the hol- ding	Allocations made for				Balance available
		Paddy	Chillies	Vegeta- bles	Country tobacco	
0.01 -2.50	1.47	1.19	0.02	0.02	0.01	0.23
2.51 -7.50	5.00	4.06	0.06	0.06	0.03	0.79
7.51-15.00	10.69	8.69	0.13	0.13	0.07	1.67
Above 15.00	27.62	22.44	0.35	0.35	0.17	4.31

(c) Input-Output data for crops under irrigated conditions.

For the purpose of programming for the Left Bank Canal area, we have taken into account 7 crops and crop mixtures by ignoring a few unimportant crops and by grouping or combining certain other crops and crop mixtures. The details of input requirements, yields etc., for these crops under irrigated conditions are assumed as shown in the following tables. ^{No 6.16} These are based on the various sources of information referred to previously.

Table No. 6.7b

LEFT CANAL AREA (S₃)

PER ACRE INPUT REQUIREMENTS AND VALUES OF OUTPUT (INCLUDING VALUE OF BY-PRODUCT) ASSUMED AFTER IRRIGATION

S.No.	Name of crop	8 hr. man-days	8 hr. bullock-pair days required			Value of other inputs (in Rs.)	Value of material inputs (in Rs.)	Yield		Value (in Rs)	Value of byproduct (in Rs.)	Value of total output (in Rs) at 59-60 pri-ces (in Rs)	Gross value added (in Rs) Col.(14)-Col.(9)	
			June/July	Sept/Oct	Total			Value @ Rs. 3.66 per 8 hr. bullock pair day (in Rs.)	Weight (in mds)					Price per md (in Rs)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1.	Irrigated Paddy	50	4	-	8	29.28	50	79.28	24.00	12.50	300.00	55.00	355.00	275.72
2.	Chillies	60	-	3.5	7	25.62	120	145.62	1600 lbs.	69.49	1350.89	3.00	1353.89	1208.27
3.	Country tobacco	30	-	4	8	29.28	60	89.28	6.01	36.63	220.08	2.00	222.08	132.80
4.	Cotton	30	3	4	6	21.96	18	39.26	100 lbs	24.50	119.07	-	119.07	79.81
5.	Groundnut	50	2	-	4	14.64	50	64.64	11.00	17.85	196.35	3.00	199.35	134.71
6.	Other cereals	25	-	3	6	21.96	40	61.26	11.25	12.05	135.58	15.00	150.58	89.32
7.	Castor	15	2.5	-	5	18.30	10	28.30	4.00	13.16	52.64	-	52.64	24.34
8.	Jowar + Cucumber	25	-	3.5	7	25.62	30	55.62	11.00	12.89	141.74	20.00	161.74	106.12
9.	Groundnut + Red gram	55	2	-	4	14.64	50	64.64	12.00	17.25	206.96	5.00	211.96	147.32
10.	Other mixtures	23	2.5	-	5	18.30	16	34.30	10.50	13.59	142.74	12.50	155.24	120.94
11.	Vegetables	-	-	-	2	7.32	78	85.32	-	-	-	-	138.10	52.78

(b) Resources.

On the basis of information we have collected for the Left Bank Canal area regarding resources available for crop production, it is found that all the three kinds of resources, namely human labour, bullock labour and other variable inputs, constitute limitational factors, and are not adequate at their existing levels of supply for full utilisation of the land resource, under irrigated conditions. This difficulty arises particularly because it is proposed to give water for wet crops for a high proportion (6.5 / 8.0) of the ayacut in the Left Bank Canal area. As we have done in the case of programming for the Right Bank Canal area, we have assumed that additional resources will become available partly due to natural growth of work force and stock of work cattle and partly due to private or Government programmes for improving the supply of all these resources in the region. The resources available at present and the additional resources assumed to become available to the four typical holdings are shown in the following table ^{MS} 6.17, 6.18 and 6.19

Table No. 6.17.

June / July Human labour (in 8 hr. mandays)

Size-group (acres)	At present available	Assumed available	Set apart for Paddy	Balance available
7.51-15.00	83.40	116.76	103.63	8.13
Above 15.00	99.30	317.76	230.50	37.26

Note:- In the first size group the number of family workers whose main employment is agriculture, is 1.52 per acre. This makes 66.90 mandays available in June/July for the typical holding, and the June/July requirement of the Paddy crop (for the 6.5/8.0 part of the holding) is only 14.33 mandays. In the second size group the number of family workers whose main employment is agriculture, is 0.49 per acre. This makes 73.50

Table No. 6.18

June/July bullock labour (in 8 hr. bullock pair days)

Size-group (acres)	At present available	Assumed available	Set apart for Paddy	Balance available
0.01 - 2.50	6.83	10.25	4.76	5.49
2.51 - 7.50	16.50	24.75	16.24	8.51
7.51 -15.00	28.86	43.29	34.76	8.53
Above 15.00	53.00	92.80	89.76	3.04

Table No. 6.19

Other variable inputs (in Rs.)

Size-group (acres)	Available at present	Assumed available	Chil-lies	Country tobacco	Set apart for Paddy	Vege-tables	Balance available
0.01-2.50	61.41	92.12	2.40	0.60	59.50	1.56	28.06
2.51-7.50	120.65	241.30	7.20	1.80	203.00	4.68	24.62
7.51-15.00	236.14	590.36	15.60	4.20	434.50	10.14	125.92
Above 15.00	496.83	1490.65	42.00	10.20	1122.00	27.30	239.15

(d) Results of Programming.

For the Left Bank Canal area also, programming is done with the object of maximising the value-added to material costs in crop production. Out of the 7 crops and crop mixtures selected for programming, two have turned out to be inefficient namely castor and other cereals group (Jowar, Variga, Bajra and Korra, etc.). The optimal crop pattern finally

arrived at by the simplex method for each of the four typical holdings and for the region as a whole are shown in the following tables Nos. 6.20 and 6.21.

to table No. 6.17
 Note:- (Contd.). mandays available in June/July for the holding. The paddy crop requirement in this case is 50.75 mandays. Hence, human labour is not considered a limitational factor in these two size groups.

Table No. 6.20

Optimal Crop Pattern for individual farmers in different size groups (Left Canal Area) (in acres)

Size-group (in acres)	Average size	Areas allocated to				Areas as determined by programming		
		Chillies	Country tobacco	Paddy	Vegeta- bles	Jowar + Cucumber	Groundnut + redgram	Other mixtures
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0.01 - 2.50	1.47	0.02	0.01	1.19	0.02	-	0.23	-
2.51 - 7.50	5.00	0.06	0.03	4.06	0.06	-	0.35	0.44
7.51 -15.00	10.69	0.13	0.07	8.69	0.13	1.03	0.59	-
Above 15.00	27.62	0.35	0.17	22.44	0.45	2.79	1.52	-

Table No. 6.21

OPTIMAL CROP PATTERN OBTAINED FOR 8.00 LAKHS OF ACRES (LEFT CANAL AREA)

Size-group (in acres)	Total acre- age	Chillies	Country tobacco	Paddy	Vegetables	G'nut+Redgram	Jowar+Cucumber	Other mixtures
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0.01 -2.50	24,160	302.00	151.00	19,630.00	302.00	3,775.00	-	-
2.51 -7.50	1,47,200	1,840.00	920.00	1,19,600.00	1,840.00	10,189.00	-	12,811.00
7.51-15.00	2,07,360	2,592.00	1,296.00	1,68,430.00	2,592.00	11,447.00	20,953.00	-
Above 15.00	4,21,280	5,266.00	2,633.00	3,42,290.00	5,266.00	23,215.00	42,610.00	-
Total	8,00,000	10,000.00	50,00.00 5,000.00	6,50,000.00	10,000.00	48,626.00	63,563.00	12,811.00

It is clear from the above tables Nos. 6.20 and 6.21 that groundnut+redgram, jowar+cucumber and other mixtures have come into the optimal crop pattern. These are also the crops with high value added per acre under conditions of irrigation, on the basis of the input-output coefficients assumed. Under the existing conditions also, jowar mixed with pulses and mixed with others, and groundnut+redgram, show each high value-added, per acre. It is therefore not unreasonable to expect that the ayacut available for dry irrigation excluding allocations for chillies, country tobacco and vegetables will be used for such mixed crop.

6.9 Intensity of cropping in the irrigated area.

It may be noted that the optimal crop patterns arrived at by programming for the Right and Left Bank Canal areas, refer only to the net irrigated areas in the region and do not make any allowance for higher intensities of cropping. In all irrigated areas, there is always the possibility of raising fodder or manure crops, pulse crops or oil seeds in the irrigated paddy fallows when paddy is raised during the kharif season, especially when short duration paddy crop is raised. Similarly, a second crop of fodder-jowar or pulses may be raised in the fields after the harvest of dry irrigated crops of the kharif season. If water is supplied for irrigating Rabi crops only, some kharif crops are certain to be raised on the same lands under rain-fed conditions. It is therefore necessary to assume that the intensity of cropping in the irrigated areas will be greater than one. We have not however found

it necessary to take note of this in programming for the Right and Left Bank Canal areas because the Government's policy is to supply water for one crop only, and if a second crop is raised on a field it has to be an unirrigated ~~xx~~ crop with lower input requirements per acre as compared with the requirements of irrigated crops.

On the basis of the information available regarding the intensity of cropping in the delta areas adjacent to the Project, and taking note of the fact that ~~xxxx~~ water is not proposed to be given for a second paddy crop in the Project area, we have assumed that the intensity of cropping is not likely to be more than 1.3 (or 130%) in the irrigated areas both under the Right and Left Bank Canals. We have therefore accepted 1.3 intensity for the purpose of calculating the additional output and value-added arising out of higher intensity of cropping. We have further assumed that under the Right Bank Canal area (in S_1 and S_2) 15% of the additional cropped area will be used for raising fodders and manure crops, 10% for pulse crops or grams and 5% for oil seeds (gingelly or castor). Similarly, we have assumed that in S_3 (i.e., under the Left Bank Canal) 15% of the additional cropped area will be used for raising fodder or manure crops and another 15% for raising pulses or grams. The output and value-added per acre for these crops are assumed to remain unchanged because they continue to be unirrigated crops as at present. It may be seen from the following table No. 6.22 which gives the necessary details, that gross value of output increases on account of

higher intensity of cropping, by Rs.125 lakhs on the Right Bank Canal side and by Rs.72 lakhs on the Left Bank Canal side.

Table No. 6.22

Details of additional cropped area due to higher intensity, additional value of output and value added in the Project area

<u>Item</u>	<u>Right Bank Canal</u>	<u>Left Bank Canal</u>
1. Intensity of cropping	1.3	1.3
2. <u>Additional cropped area (in acres)</u>		
i) Fodders and manure crops	1,68,600	1,20,000
ii) Pulses or grams	1,12,400	1,20,000
iii) Oil seeds (Gingelly or castor)	56,200	...
Total	3,37,200	2,40,000
3. <u>Additional value of output (in Rs)</u>		
i) Fodders and manure crops	52,71,100	46,39,200
ii) Pulses or grams	50,17,536	37,03,200
iii) Oil seeds	22,13,710	...
Total	1,25,02,346	83,42,400
4. <u>Additional value added (in Rs.)</u>		
i) Fodders and manure crops	29,50,500	32,19,600
ii) Pulses or grams	23,69,572	18,60,000
iii) Oil seeds	13,78,024	...
Total Rs.	71,98,096	50,79,600

6.10 Estimate of total agricultural output after irrigation.

We are now in a position to make final estimates of the total value of agricultural output after irrigation in the Project areas under the Right Bank Canal and Left Bank Canal and compare them with the estimates already made for the year 1959-60. The details are furnished in the following table No. 6.23.

Table No. 6.23

Details of Estimate of Agricultural output after irrigation

Item	Right Bank Canal side			Left Bank Canal side	
	1959-60 (in lakhs)	After irrigation		1959-60 (in lakhs)	After irrigation (in lakhs)
		Irrigated (in lakhs)	Unirrigated (in lakhs)		
1. Net cultivated area (in acres)	12.11	11.24	0.87	6.23	8.00
2. Gross cropped area (in acres)	12.22	15.61	0.87	6.91	10.40
3. Gross value of output (in Rs)	1727.9	5061.6	124.1	609.8	2777.0
4. Value added to material inputs (in Rs.)	1013.5	4031.6	72.8	333.7	2130.3
5. Increase in value-added (in Rs.)	-	3140.9		-	1791.6
6. <u>Yields (in mds.)</u>					
i) Food grains	50.77	153.56(107.79)	-	26.31	162.63 (136.37)
ii) Chillies	1.25	29.17(27.92)	-	0.43	1.94 (1.51)
iii) Groundnut	3.65	-	-	6.23	4.86 (-1.37)
iv) Country tobacco	2.97	6.00 (3.03)	-	0.04	0.30 (0.26)
v) Red gram, other grams and pulses	4.54	3.21 + 3.04@ (1.71)	-	2.65	1.04 + 2.60@ (0.99)

Note:- Figures in brackets indicate the increases in yields after irrigation.

@:- This is the result of higher intensity assumed after irrigation.

The ^{Gross}~~gross~~ value of output in the total cultivated area of 12.11 lakhs of acres (or 12.22 lakhs of acres of cropped area) under the Right Bank Canal has come to Rs. 1727.9 lakhs for the year 1959-60, according to our estimate. After irrigation it has increased by more than three times, amounting to Rs. 4936.6 lakhs for the 11.24 lakh acres of net irrigated area, plus Rs. 125.0 lakhs for the additional cropped area based on cropping intensity of 130%, plus Rs. 124.1 lakhs for the unirrigated area of 0.37 lakhs of acres which is assumed to remain ~~work~~ constant. The increase in the gross value of output after irrigation amounting to a total ~~amount~~ of Rs. 3457.3 lakhs has to be attributed to the higher yields of crops under irrigated conditions, changes in the cropping pattern and the higher intensity of cropping in the irrigated area. The total amount of value added to material inputs can be raised after irrigation to Rs. 4154.4 lakhs which is nearly four times the present value, viz. Rs. 1013.5 lakhs, the net increase in value-added amounting to Rs. 3140.9 lakhs.

On the Left Bank Canal side, the gross value of output in the total cultivated area of 6.23 lakhs of acres at present (or 6.91 lakhs of cropped area) has amounted to Rs. 609.8 lakhs. After irrigation this is found to increase more than four times amounting to Rs. 2693.6 lakhs for the net irrigated area of 3.0 lakhs of acres plus Rs. 83.4 lakhs for the additional acreage based on cropping intensity of 130%. The value-added to material inputs is found to increase, after irrigation by more than six times, the net increase in value added amounting to Rs. 1791.6 lakhs. The substantial increase x in gross output

and value added on the Left Bank Canal side has to be attributed to the following important factors: .

- (i) an increase of total cultivated area by 1.77 lakhs of acres, constituting nearly 30% increase over the existing area;
- (ii) a high proportion of the ayacut coming under irrigated paddy crop (i.e. 6.5 lakhs of acres out of 8.0 lakh of acres).
- (iii) the higher yields assumed for irrigated paddy and other dry irrigated crops;
- (iv) the changes in the cropping pattern adopted; and
- (v) higher intensity of cropping

As may be seen from the above table No. 6.23, there is also a substantial increase after irrigation in the estimated outturn of food grains, oil seeds, and other produce both under the Right and Left Bank Canals.

RESOURCE REQUIREMENTS FOR THE OPTIMAL CROP PATTERN7.1. General.

As referred to in the two previous chapters, we have classified the resources required in crop production into three categories, viz., (1) human labour (2) bullock labour and (3) other variable inputs comprising seed, manures and fertilisers etc. It is essential to bear in mind that these resources refer to physical resources required in crop production. The full development of the ayacut both under the Right and Left Bank Canals, according to the optimal crop patterns we have estimated over a period of 10 to 15 years after the Krishna waters begin to flow into the Nagarjunasagar Canals, requires additional resources not only under the above three categories but also additional resources for the conversion of dry lands to suit canal irrigation and for trade and transport of farm materials and produce. It is proposed to make a detailed study of these resource requirements in this chapter.

7.2. Resource requirements for the Right Bank Canal area.

As already pointed out, the supply of farm family labour and agricultural labour in the villages under the Right Bank Canal will not be a limitational factor for achieving the optimal cropping pattern.¹ As regards bullock labour, we have found that a high proportion of the June/July bullock labour available at present will be required for the irrigated paddy crop (i.e. 1498 thousand bullock pair days out of 2066 thousand bullock-pair days available.) Our estimate of September/October requirements of bullock labour is 19.4 lakhs of bullock pair days for

¹ It may be noted in this connection that there is considerable seasonal migration of labour during the time of transplantation of paddy to neighbouring delta areas in the adjoining districts. This is likely to cease after irrigation in the Project area. It means that shortage of human labour in the peak demand months may be felt in the delta areas ^{and} the Project region taken together.

dry irrigated crops and 4.2 lakhs of bullock pair days for the unirrigated part of the land in the ayacut villages. The amount of bullock labour available for raising crops in 1959-60 according to our estimate is 10.67 lakhs of bullock pair days. A shortage of bullock labour of 2.96 lakhs of bullock pair days (or nearly 10,000 pairs of work cattle) is thus likely to arise on the Right Bank Canal side, unless the supply of bullock labour increases by nearly 15 per cent over a period of 10 years. According to our Census survey, the annual rate of increase of work cattle is only 0.33 per cent in S_1 villages and 1.29 per cent in S_2 villages (0.8 per cent in S_1 and S_2 put together). It therefore becomes important for the Project authorities to take special measures to augment the supply of bullock power. The rate of growth of supply of bullock labour has to be at least twice the natural rate of growth, unless mechanization of some of the agricultural operations during the peak demand months is encouraged.²

As already stated, the amount of other variable inputs which may be treated as current production expenses, includes the value of seed, manures and fertilisers, pesticides, hire charges for implements and fuel costs, whether they are farm produced or purchased. According to our estimate, the total value of these inputs for the year 1959-60 comes to Rs. 355.6 lakhs. The amount required for the optimal crop pattern in the irrigated ayacut of 11.24 lakhs of acres is estimated at Rs. 578.7 lakhs. The requirement for the area of 87,000 acres which continues to be under Virginia tobacco and other unirrigated crops is

² Manpower and work cattle are also required for the important purpose of conversion of the existing dry land to suit canal irrigation. The usual operations involved are, digging, levelling, bunding, terracing etc. It is however reasonable to assume in regard to this matter that these operations may be expected to be undertaken when land is fallow and not during the crop seasons. No allowance is therefore made for additional requirements of these physical resources for conversion purposes. The conversion costs, are considered separately and estimated.

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Rs. 119.9 lakhs. Taking these things together into consideration, we arrive at an estimate of Rs. 343.1 lakhs as the additional amount required in the form of other variable inputs, which constitutes an increase of 96.5 per cent over the existing available quantity. On the basis of information available in the Farm Management Studies and the information collected in our Farm surveys, about 60 per cent of the value of other variable inputs may be considered as the value of seed (or seedlings) and about 30 per cent as the value of manures and fertilisers, the remaining 10 per cent being the value of hire charges for implements, pesticides etc.

7. 3. Resource requirements for the Left Bank Canal Area.

We have found that all the three categories of physical resources taken into account for programming are limitation- al factors on the Left Bank Canal side. This situation arises primarily because of the fact that the proposed ayacut area has considerably increased and more than 80 per cent of it is localised for wet crops.

Our estimate of the human labour supply available at present for crop production is 36,89,662 man-days for the peak demand month of June/July. We have arrived at this figure by taking into account all the workers in the villages belonging to both cultivator and non-cultivator households and having owner cultivation, tenant cultivation, agricultural labour and annual servant labour as main employments. These categories of workers together constitute about 85 per cent of the total work-force in the villages. About 50 per cent of the employment of these workers is utilised for farm work other than crop production such as the maintenance of cattle, dairying and poultry keeping, service or business, etc.

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The amount of human labour available for crop production for the year 1959-60 is estimated after making due allowance for this. The actual requirement of human labour during the peak month of June/July after irrigation, is estimated at 88.8 lakhs of man days, out of which 81.2 lakhs are required for 6.5 lakhs of acres under irrigated paddy. A serious shortage of supply of human labour is thus certain to arise on the Left Bank Canal side. The total work force has to be more than doubled over a period of 10 years. The natural rate of growth of work force in the region may provide for an additional 20 per cent of the existing labour supply or approximately 8 lakhs of man days during June/July month. But, this will constitute only 10 to 15 per cent of the additional total requirement. Hence, steps have to be taken immediately for planned ^{migration} of population to the region on a large scale. How far mechanization of the operations normally undertaken in the months of June/July for the cultivation of wet paddy, will meet the problem of shortage of human labour has also to be thoroughly examined.

The total amount of bullock labour available at present during the peak demand month of June/July for crop production has been estimated by us at 14.31 lakhs of bullock-pair days. The actual requirement for the optimal crop pattern is estimated at 27.29 lakhs of bullock-pair days, out of which 25.99 lakhs of bullock pair days is the requirement of the paddy crop. ^{Thus} a serious shortage of bullock labour supply is also ~~thus~~ certain to arise on the Left Bank Canal side, amounting to 13.0 lakhs of bullock-pair days. It means that the supply of bullock labour has nearly to be doubled as in the case of human labour. According to our Census survey, the natural rate of growth of work cattle in S₃ (Left Bank Canal area) is found to be 2.34 per cent per year.

This leads us to the conclusion that the Project Authorities have to take early steps to augment the supply of bullock labour substantially and also encourage mechanization of June/July seasonal operations requiring bullock labour.³

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The total amount of other variable inputs is estimated at Rs.1.30 crores for the year 1959-60, and the actual requirement for the optimal crop pattern at Rs.3.93 crores. The amount of other variable inputs thus required after irrigation has to be increased by nearly three times the amount available at present or by an additional amount of Rs.2.63 crores. This amount may be allocated to seed, manures and fertilisers, and others in the ratio of 6:3:1.

7.4. Financial implication of resource requirements for the Optimal crop pattern.

In our study of the resource requirements for the optimal crop pattern with reference to human labour, bullock labour and other variable inputs, we are concerned till now with the physical resource requirements for crop production only. It is now necessary for us to evaluate the financial implications of these resource requirements. There are two important factors which must be taken into account in this connection. Firstly, the farmers provide themselves with certain proportion of their requirements out of their own resources. In the case of human labour, for instance the bulk of it is usually provided by hired labour especially in the higher size groups of holdings. On the other hand in the case of bullock labour, a considerable proportion of the required amount is owned by the farmers except in lower size groups. In the case of seed and farm yard manure also cash transactions usually form a high proportion of the requirements. In the case of fertilisers

³ The number of bullock pairs required can be computed by dividing the figures of pair days given, by 30.

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and pesticides, the entire requirements have to be of course purchased by the farmers. The farmers at present depend partly on their own resources and partly on the credit provided by ^{the} money lenders for purchase of these resources. The second factor for consideration is that farmers have to invest considerable amount of capital in acquiring agricultural assets necessary for crop production like bullocks, machinery and implements, farm buildings etc. For the acquisition of these assets also, farmers depend partly on credit provided by the money lenders. The first consideration raises the question of providing adequate short-term credit for the farmers to meet their current production expenses, while the second consideration raises the question of providing adequate medium and long term credit to enable them to acquire the required agricultural assets.

7. 5. Short-term capital requirements.

The short term capital requirements of the farmers in the Project area after irrigation may be considered under the following heads:

- i) Finance required for payment of wages to hired labour,
- ii) finance required for payment of hire charges for bullocks,
- iii) finance required for the purchase of seed or seedlings,
- iv) finance required for the purchase of manures and fertilisers, and
- v) finance required for the purchase of other materials and hire charges for implements etc.

The following procedure is followed for estimating the total short-term capital requirements for both the Right and Left Bank Canal areas. On the basis of input requirements for wet paddy and dry irrigated crops entering into the optimal crop pattern, we have first estimated the aggregate physical requirements of human labour and bullock labour. We have

next taken the proportion of hired resources in the total 246
as 80 per cent in the case of human labour and 20 per cent in
the case of bullock labour on the basis of information avail-
able in Farm Management Studies in the West Godavari district
Finally in order to arrive at the financial requirements,
we have taken into account the average wage rates for hired
labour and hired bullock labour prevailing in sample villages
during 1959-60. In the case of other variable inputs which
are calculated in terms of money, we have taken into account
the information available in the Farm Management Studies and
our Farm Surveys regarding ^{quantification} of specific inputs
and assumed that 70 per cent in the case of seed or seedlings,
60 per cent in the case of manures and fertilisers, and 100
per cent in the case of others (pesticides, hire charges
for implements, etc.) will be the financial requirement.
Full details are given in the following table No. 7.1.

Table No. 7.1.

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Requirements of short-term finance
(All figures in lakhs of
units)

Item	Right Bank Canal area	Left Bank Canal area
(1)	(2)	(3)
<u>1. Human labour</u>		
(a) Total requirement (in man-days)	536.11	385.72
(b) Requirement of Hired labour (in man-days)	428.89	308.58
(c) Value of Hired labour (in Rs.) ⁽¹⁾	579.00	533.84
<u>2. Bullock labour</u>		
(a) Total requirement (in pair days)	75.22	60.34
(b) Requirement of Hired labour (in pair days)	15.04	12.07
(c) Value of Hired labour (in Rs.) ⁽²⁾	69.64	44.18
<u>3. Other variable inputs</u>		
(a) Seed (in Rs.)	144.10	165.06
(b) Manures & fertilisers (in Rs.)	61.76	70.74
(c) Others (in Rs.)	34.31	39.30
(d) Total of other variable inputs	240.17	275.10
<u>4. Financial requirement</u>		
(a) Total (in Rs.)	888.81	853.12
(b) per acre (in Rs.)	79.08	106.64
Credit Requirement	444.41	639.84

Note:- (1) The average wage rate for hired human labour is Rs.1.35 in the Right Bank Canal side and Rs.1.73 in the Left Bank side.

(2) The average wage rate for hired bullock labour is Rs.4.63 in the Right Bank Canal side and Rs.3.66 in the Left Bank Canal side.

It may be seen from the above table that the total amount of short-term finance required by the farmers comes to Rs.888.81 lakhs on the Right Bank Canal side. On the Left Bank Canal side, the total amount of finance required is estimated at Rs.853.12 lakhs. The total amount of finance required for the Project area thus comes to Rs.1741.93 lakhs or Rs.154.98 per acre.

7.6. Requirements of Long-term finance.

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The requirements of long term finance on the part of the farmers in the project area may be studied under three heads: i) finance required for purchase of work cattle; ii) finance required for purchase of machinery and implements such as ploughs, carts etc., and iii) finance required for construction or improvement of farm buildings. In estimating the financial requirements under these three heads, we have followed two different methods; one for estimating the finance required for purchase of work cattle and another for estimating the financial requirements in respect of the two other categories. In regard to finance required for purchase of bullocks we merely calculated the cost of the number of bullock pairs additionally required which is already ~~defined~~ ^{not defined}. In regard to the other two categories of assets we have taken into account the value of investment per acre as obtained for predominantly irrigated paddy zone in the West Godavari district in the Farm Management Studies and the value of investment per acre at present in the Project area as indicated in our Farm Surveys. As already pointed out, our estimates of ^{additional} bullock labour required for the optimal crop patterns under the Right and Left Bank canals are 10,000 bullock pairs and 44,000 bullock pairs respectively. At the prices prevailing at present (i.e., average value estimated for the year 1959-60), the cost of 10,000 pairs of bullocks required on the Right Canal side at Rs.650 per pair amounts to Rs.65 lakhs. The cost of 44,000 pairs of bullocks required on the Left Canal side at Rs.450 per pair amounts to Rs.198 lakhs. The cost of providing additional bullock power required in this ~~the~~ Project area as a whole thus amounts to Rs.263 lakhs.⁴

4. The question of investment in tractors as an alternative to investment in bullocks may have to be given serious thought in this connection. For wet cultivation, a pair of bullocks costing Rs.700 to 800 on average can cultivate only 8 to 10 acres while a tractor costing Rs.20,000 can be used to cultivate about 400 acres. The operating expenses of a pair of bullocks (net maintenance cost) is not likely to be less than Rs.400 to 500 per year, as compared to Rs.4,000 to 5,000 per year in the case of tractor. It is thus clear that on a per acre basis, both capital costs and operating expenses are likely to be less in the case of tractors.

On the assumption that 50 per cent of the
on the Right Canal side will be met by the cultivators from out
of their current or past savings and 25 per cent on the Left
Bank Canal side, the medium and long term credit requirements
may be estimated at Rs.181.0 lakhs. 249

The value of machinery and implements per acre in the paddy zone of the West Godavari district is estimated at Rs.31.2. According to our Farm Surveys in the Project area, it is estimated at Rs.18.67 on the Right Bank Canal side and Rs.14.35 on the Left Bank Canal side. From these we may infer that in the Project area after irrigation, investment in machinery and implements has to be increased by Rs.12.53 per acre on the Right Bank Canal side and Rs.16.85 per acre on the Left Bank Canal side or a total amount of Rs.140.84 lakhs on the Right Bank Canal side, *and Rs.134.80 lakhs on the Left Bank Canal side.* following the previous procedure of allowing 50 per cent and 25 per cent on the Right and Left Canal sides respectively for self-finance, *The* total long-term credit requirement for the purchase of machinery and implements may be estimated at Rs.70.42 lakhs and Rs.101.10 lakhs for the two areas. The value of investment in farm buildings (cattle sheds, storage sheds, etc.) per acre is estimated at Rs.78.54 in the paddy zone in the West Godavari district, which exceeds our estimates of the value of investment in farm buildings on the Right and Left Bank Canal sides at present by Rs.50.74 and Rs.50.64 respectively. On the basis of this information, the total finance required for construction or improvement of farm buildings will come to Rs.570.32 lakhs for the Right Bank Canal side and Rs.405.12 lakhs for the Left Bank Canal side. If allowance is made for self-finance, the total credit requirements will amount to Rs.285.16 lakhs for the Right Bank Canal side and Rs.303.84 lakhs for the Left Bank Canal side.

The total amount of long and medium term finance required for investment in work cattle, machinery and implements and farm buildings and the total credit requirements are shown in the following table No. 7.2. for the Right and Left Bank Canal sides.

Table No. 7.2.

Long-term finance and credit requirements (in lakhs of Rupees)

Item	Right canal Side		Left canal side		Project Area	
	Total	Credit	Total	credit	Total	Credit
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Finance required for purchase of work cattle	65.00	32.50	198.00	148.50	263.00	181.00
2. Finance required for purchase of machinery and implements.	140.84	70.42	134.80	101.10	275.64	171.52
3. Finance required for investment in farm buildings	570.32	285.16	405.12	303.84	975.44	589.00
Total	776.16	388.08	737.92	533.44	1514.08	941.52

The total amount of short-term and long-term finance and credit required to enable the farmers in the Project area to achieve the optimal cropping pattern over a period of 10 to 15 years may be given in the following table No. 7.3.

Table No. 7.3.

Short-term and long-term finance and credit requirements of the farmers in the Project area.
(Figures in Lakhs of Rs.)

Item	Right Bank Canal		Left Bank Canal		Project area	
	Total require- ment	Credit require- ment	Total require ment	Credit require- ment	Total Require- ment	Credit require- ment
<u>1. Short-term finance for crop production</u>						
(a) Human labour	579.00	289.50	533.84	400.38	1112.84	689.88
(b) Bullock labour	69.64	34.82	44.18	33.14	113.82	67.96
(c) Seed	144.10	72.05	165.06	123.80	309.16	195.85
(d) Manures & fertilisers	61.76	30.88	70.74	53.05	132.50	83.93
(e) Others	34.31	17.16	39.30	29.47	73.61	46.63
Total	888.81	444.41	853.12	639.84	1741.93	1084.25
<u>2. Long-term finance for crop production</u>						
(a) Purchase of bullocks	65.00	32.50	198.00	148.50	263.00	181.00
(b) Purchase of implements and machinery	140.84	70.42	134.80	101.10	275.64	171.52
(c) Investment in farm buildings	570.32 776.16	285.16	405.12	303.84	975.44	654.00 589.00
Total	776.16	388.08	737.92	553.44	1514.08	941.52
<u>3. Long-term finance for land improvement (See Section 7.7)</u>	2248.00	1124.00	1600.00	1200.00	3848.00	2324.00
Grand total	3912.97	1956.49	3191.04	2393.28	7104.01	4349.77

7.7. Cost of land reclamation or cost of conversion of existing dry land for irrigation.

The problem of estimating the cost of land reclamation for conversion of the existing dry lands for irrigation is beset with several difficulties because it depends on a number of factors such as the topography and nature of the soils, slope or gradient in fields or blocks of areas (whether conversion is made by the use of bulldozers and other mechanical methods or by the use of manual labour) service costs of mechanical appliances, wage rates, etc. It also depends to some extent on the question whether a given field or block is localized for wet crops or for dry irrigated crops, because it is generally held that the costs of conversion of land to suit dry irrigation will be considerably less than for conversion to suit wet irrigation. At present in the ayacut villages under the Right Bank Canal, the estimated extent of land irrigated under wells or tanks comes to 3.53 per cent of the cultivated area in S₁ and 5.13 per cent in S₂ (4.32 per cent taking S₁ and S₂ together). In S₃ i.e., under the Left Bank Canal area, irrigated area is estimated to constitute considerably a higher percentage in total cultivated area i.e. 7.61 per cent. More than 90 per cent of the land in the Project area is thus dry land, but it is difficult to say precisely what proportion of this area requires considerable outlay for purpose of conversion to suit wet or dry irrigation. It is reasonable to assume, however, that some outlay, small or large, will be necessary to make every field fit for irrigation, since conversion operations include not only removal of shrubs and roots, digging and levelling, but also bunding, terracing, digging of field channels, etc. As pointed out in an earlier chapter, the ^{land} is considerably ^{undulating} on the Left Canal side as compared ^{with} the Right Canal side. There are both red and black soils in the Project area, although there is a greater predominance of black soil on the Right Bank Canal side.

Surface soil depth is also found to vary considerably in the different parts of the ayacut. Similarly, there is great variation in slope of lands: Land with fairly level and gentle slope constitutes nearly 40 per cent of the area on the Right Bank Canal side. Most of the area under the Left Bank Canal has greater than 2 per cent slope.

The cultivators of the Right Bank Canal side seem to think that the cost of reclamation for full wet lands varies from Rs. 200 to 500 per acre while the cultivators of the Left Bank Canal area seem to estimate this cost to vary from Rs. 100 to 300 per acre. The cost of reclamation of lands for dry irrigation under the Right Bank Canal may be estimated at a lower figure ranging from Rs. 50 to 200 per acre. It is said that in the Musi Project area where the lands are somewhat less rugged and uneven than the lands under the Left Bank Canal, the cost of conversion has come to an average figure of Rs. 200 per acre. The enquiries made by the staff of the Agricultural Credit Department of ^{The} Reserve Bank of India suggest that Rs. 200 to 300 per acre may be taken as the approximate rate for conversion of dry lands for irrigation under the Left Bank Canal, and Rs. 300 to 400 for full wet lands and Rs. 100 to 150 for dry irrigated lands under the Right Bank Canal. It is also estimated by engineers that there is an area of about 3 lakhs of acres under the Right Bank Canal and about 1 lakh acres under the Left Bank Canal which are suitable for conversion by mechanical appliances. Conversion by the use of machines will be somewhat cheaper than conversion by the use of manual labour. In the course of our survey we have also attempted to collect some detailed information about costs of conversion in two purposively selected areas adjacent to the ayacut which have been

recently brought under irrigation.⁵ According to these studies, we find that the cost conversion for full wet irrigation will vary from Rs.150 to 275 per acre. The details are as follows.

<u>Cost of conversion per acre</u> (in Rs)			
<u>Village</u>	<u>1946-50</u>	<u>1951-56</u>	<u>1957-58</u>
1. Pynampalli	233.96	275.37	202.50
2. Gollapudi, Rayanapadu, and Guntupalli	192.87	158.31	145.91

We may therefore finally adopt an average rate of Rs.200 per acre as cost of conversion both under the Right and Left Bank Canals. This will give us a total estimate of Rs.38.48 crores (i.e., Rs.22.48 crores under the Right Bank Canal and Rs.16.00 crores under the Left Bank Canal) which has to be spread over a period of 10 years. About 50 per cent of the total finance required for conversion on the Right Bank Canal side may be expected to be provided by the cultivators themselves from out of their current or past savings. On the other hand, cultivators on the Left Bank Canal side may not be expected to contribute more than 25 per cent of the total finance required from their savings. It becomes therefore the responsibility of the Government to provide directly or through co-operative societies substantial amount of credit to the cultivators if land development in the Project area is to be rapidly brought about (i.e., Rs.11.24 crores for the Right Bank Canal side and Rs.12.00 crores for the Left Bank Canal side).

5. One is the village, Pynampalli which comes under the ayacut of Palair irrigation project on the Left Bank Canal side. More than 70 per cent of the area in this village was converted during 1951-56. The other area consists of three villages Gollapudi, Rayannapadu, and Guntupalli which come under Vijayawada taluk of the Krishna district. A high proportion of the ayacut of these villages was brought under irrigation in 1946.

→ the Guntupalli pumping scheme located in the

7.8. Trade and transport in the Project area.

It is common knowledge that adequate development of road and rail transport facilities and organisation of trading and financial institutions, particularly on a co-operative basis, are essential not only for the rapid development of the ayacut but also for giving maximum benefit to the producers and consumers in the area. ^{for} The substantial increase in agricultural output, both under the Right and Left Bank Canals of the Project, ~~is to be~~ ^{sustained, the region} ~~is to be~~ needs wide and well-organised net work of village and district roads, State and National highways, ~~and~~ railways and extension of commercial and co-operative banking ~~in the area~~ to provide finance for private and co-operative marketing agencies. It is proposed to make a brief reference to these important matters in this section. No attempt will however be made to make a detailed estimate of the capital and maintenance costs involved in extending and improving trade and transport organisation in the Project area.

According to our study of agricultural production in the Project area, the output of food grains after irrigation is estimated to increase by a little more than three times on the Right Bank Canal side and by nearly six times on the Left Bank Canal side. The output of grams and pulses is estimated to increase by about 50 per cent in both the areas of the Project. The output of all other crops is similarly estimated to increase except in the case of oil seeds as the area under oil seeds has come to be much reduced in the optimal cropping pattern. The relevant details of the additional output of various crops in the Project area after irrigation are as follows.

<u>I- Term</u>	<u>Increase</u> (in lakhs of maunds)
1. Food grains	284.43 244.16
2. Chillies	29.43
3. Country tobacco	3.29
4. Redgram or pulses	2.70

Agricultural development in the Project area is thus expected to add substantially to the marketable surplus and also to the exportable surplus in rice, pulses, chillies and other produce; and in a rapidly developing region demand for trade and transport facilities has also to be expected to grow correspondingly.⁶

7.9. Transport development.

(a) Roads. It is estimated that in the ayacut area of the Project taking together both the Right and Left Bank Canal areas, there are only 1675 miles of roads which work out to a low figure of 0.34 miles length of roads per square mile, compared with 0.70 miles length of roads normally required in a developed agricultural area. It follows that, as the flow of Krishna waters in the Canals begins to bring about rapid agricultural development, provision of roads has ~~not~~ ~~only~~ also to be accelerated. The existing mileage of roads has not only to be improved but also has to be nearly doubled over a period of 10 to 15 years. The Highways Department of the State Government has suggested that the cost of roads development in the Project area, taking into account various classes of roads to be provided, may come to nearly Rs. 33 crores. While keeping in view a long term plan of such dimensions it will be necessary to give high priority to construction of village roads connecting them to market centres and railway stations

6. It is interesting to note that the Department of Agriculture, Andhra Pradesh, has estimated on the basis of the cropping pattern suggested by itself, the annual gross returns from the ayacut when fully developed will be 12.5 lakh tons of food-grains 3 lakhs bales of cotton, 1.8 lakhs tons of groundnut, 37,000 tons of chillies and 30,000 tons of jaggery.

A well developed system of district and village roads and State and National Highways is also essential for facilitating the use of motor vehicles for both freight and passenger traffic.

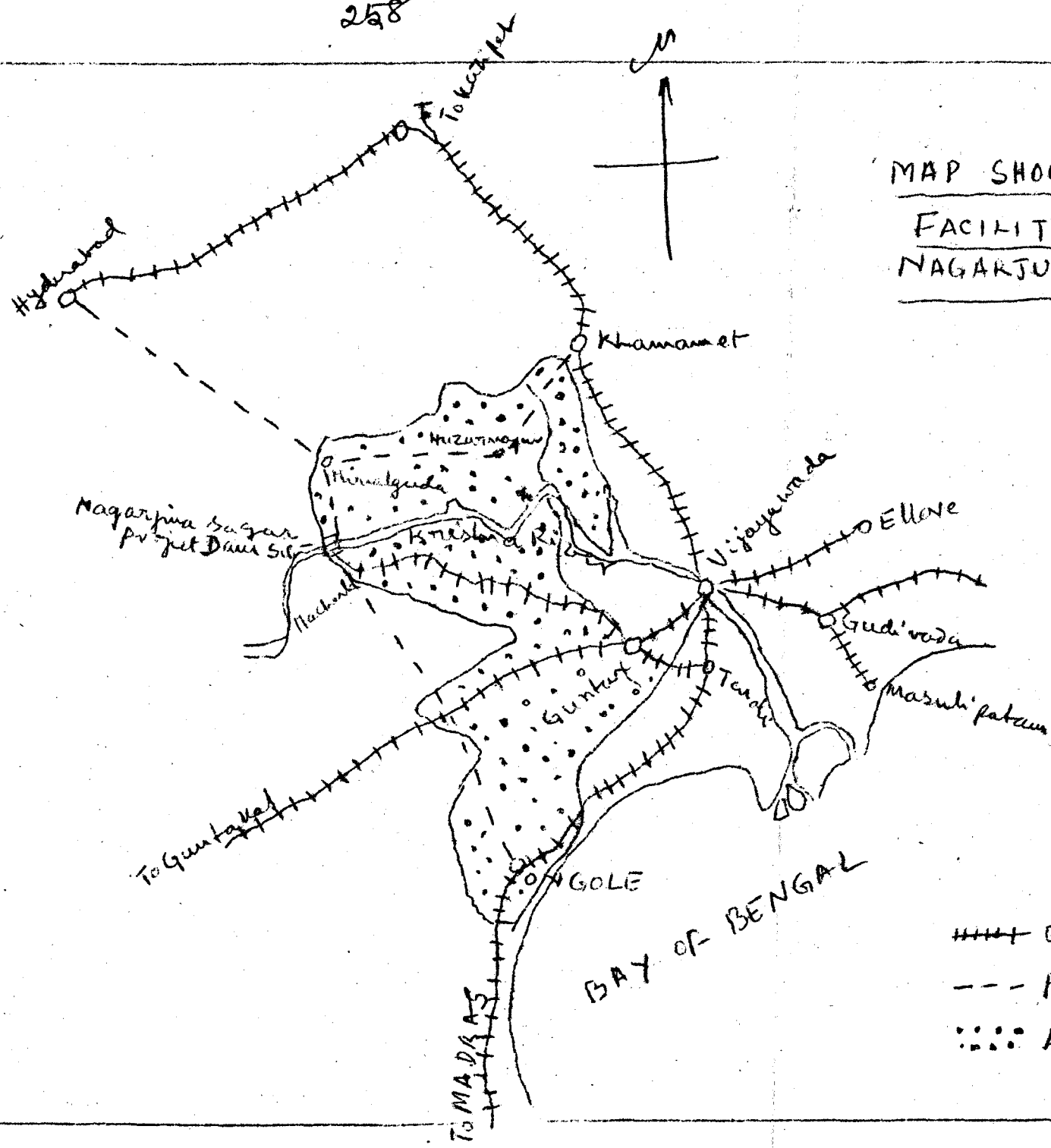
b) Rail transport:

only a part of the project area on the Right Canal side is served by the ~~Southern~~ ^{Ra} Railway ~~in these circumstances~~. ~~Secondly~~, we have the Guntur-Macherla metre gauge line with a length of 80 miles extended recently upto the dam side, ~~secondly~~, ^{and} ~~there is~~ the Guntur-Guntakal metre gauge line which passes through Sattenapalle, Narasaraopet and Vinukonda taluks. ~~Lastly, there is~~ The Vijayawada Madras Broad gauge line running ^{side} mostly outer the ayacut area. From the accompanying ^{map} figure it is clear that a considerable extent of the ayacut area lying to the east and south of the Guntur-Narasaraopet line is very inadequately served by ~~the~~ railway transport.

It is therefore of utmost importance that a new railway line is constructed connecting the Nagarjunasagar dam side with the Ongole railway station as recommended ⁱⁿ by the Techno-Economic Survey of Andhra Pradesh. This line will ^{also} help avoid the transport of the produce to south through the circuitous and already over-congested route via. Vijayawada.

It is also of vital importance to convert the present Guntur-Macherla metre gauge line into a broad gauge line so as to facilitate not only efficient transport of produce of the ayacut area but also to accelerate the pace of industrialization of area between Guntur and Macherla. In this connection the existing siding of the railway line, Macherla to Dam side, should be taken over and retained by the Railway and converted into a broad gauge line as a permanent rail link between Macherla and dam side.

MAP SHOWING RAIL TRANSPORT FACILITIES IN THE NAGARJUNA SAGAR PROJECT AYACUT



- ==== Existing Railway lines
- Proposed Railway line.
- Ayacut in the 1st phase.

On the Left Canal side, there is no railway line running at present through the project area, the Vijayawada-Kazipet line being away from the boundary of the ayacut fixed for the 1st phase. With the policy of localisation of nearly 80% wet on the Left Canal side, the area is likely to become densely populated and the trade and commerce increasing ^{several} fold. To add to this the Nalgonda district is said to be rich in mineral resources. A railway line from dam site to Hyderabad, the capital of Andhra Pradesh via Miriyalaguda is a special need of the region for a rapid development of the area, agriculturally and otherwise.

By far the most important requirements of the region is ^{is} being opened up by a railway line from the dam site to Khammam. This line will run ^{almost} entirely as an artery ^{within the ayacut zone.} for the flow of traffic between the dam site and the Vijayawada-Kazipet railway line.

c) Inland navigation: In order to facilitate traffic within the Project area major canals in the Project area have to be developed suitably for traffic. Inland waterways ~~transport~~ can become a most valuable facility supplementing road and railway transport. It will also ~~help~~ the development of industries connected with canal traffic such as the manufacture of country craft.

The transport facilities have to be developed at least simultaneously with the completion of the project if not in advance so that the resources required for crop production, equipment needed for processing industries, etc., can be transported to various places in the project area, and the surplus produce moved out of it without leading to serious bottlenecks, and making a good part of the outlay on the project infructuous.

7.10. Trade.

As explained in Chapter III dealing with trade and finance in selected important market centres located and widely distributed in the Project area, the region is at present served mostly by private agencies in the spheres of marketing and finance. The agricultural development of the region and the large increase expected in marketable surplus and exportable surplus of agricultural produce will ^{also} bring about a great increase in demand for trade facilities and finance. Private agencies may be expected to meet the increase in demand to some extent. But, in order to provide adequate facilities and particularly to promote co-operative agencies in these spheres, the state has to play an active and purposive role. The steps to be specially taken will comprise (i) establishment of ~~of~~ regulated markets with all facilities such as market yards, warehouses etc., (ii) establishment of co-operative marketing societies; (iii) establishment and promotion of Co-operative banks; and (iv) establishment of branches by the State Bank of India and other commercial banks.

In the foregoing paragraphs we have indicated the various resource requirements and also translated their implication into financial terms. It is very necessary on the part of the Government to evolve requisite machinery and procedures for providing the farmers with the facilities required sufficiently well in advance of the completion of the project. It has been the experience in other irrigation projects that the development of the ayacut has been very tardy and disappointing for lack of proper planning in advance. In fact, one of the objectives of the present survey has been to plan for rapid development of the ayacut without bottlenecks.

Thus the modus operandi of providing the farmers with the requisite resources should engage the immediate attention of the Government.

CHAPTER - VIII

BENEFIT-COST APPRAISAL OF THE PROJECT.

8.1 General:

In this chapter we propose to make an appraisal of the benefits and costs of the first phase of the Nagarjunasagar irrigation project which is the subject of our Socio-economic Survey and investigation.

We do not propose to go into the larger issue of the optimal utilization of the waters of the river Krishna from the point of view of attaining maximum net social benefit both in the short run and in the long run. This is an issue which raises several technical and complicated questions which are not easy to settle without reference to objectives and policies ^{the} ~~relating~~ ^{of} national economic development. The problems as to where, i.e. at what points in the course of the river and to what extent and for what purposes such as irrigation, power etc., the waters of a river should be utilised, have to ^{be} examined taking into consideration the entire river basin or the entire region to which the benefits of irrigation, power etc., can be extended. However a few general observations on this problem may be relevant here.

8.2 Some general observations on river water utilisation.

Generally, in discussing the optimal utilisation of river waters from the stand point of maximum net social benefit, a number of factors have to ^{be} kept in mind. The fact that the waters of a river flow over a certain distance from a higher level to a lower level, gives rise to numerous possibilities of using the waters

at various points in the course of the river, some times the same quantity of the flow being used more than once, for purposes of irrigation of land ^{and} or generation of hydro-electric power, etc., At the same time it is a matter of fundamental importance that the total volume of waters flowing in the river and its seasonal distribution are more or less given and determined by nature. Hence, dams built across the river at various points for storage and regulation of the flow of waters not only compete with one another, but also there will be competition among various uses of the waters at each point. The nature of this competition depends on the extent to which there is net withdrawal of waters at each point. There may be complete diversion of waters for irrigation or power; there may be partial diversion. ^{and there may be little diversion.} All these are possibilities depending on the use of the waters for generation of power, irrigation, flood control etc.,

It is also of course to be considered that the construction of a dam across a river at a point does not rigidly fix the incidence of its benefit, because the area to be benefited by irrigation or power can be made flexible as canals for wet or dry irrigation and power transmission lines can be taken over short or long distances.

Another point of importance is that once the location point for the construction of a dam is selected by engineers, it is always economical to raise the height and increase the storage capacity of the dam to the highest possible level subject to engineering or other considerations because the marginal costs or incremental costs for storage and regulation of the flow of waters decrease

rapidly as the height of the dam increases. This consideration becomes extremely relevant where there are possibilities of carrying irrigation on canals or transmitting electric power over long distances at reasonable cost.

Another point worthy of consideration is, there may not be available at reasonable cost alternative methods of producing either irrigation water or electric power in the different parts of a river basin. This raises a most difficult and technical question of measurement of the social value of irrigation and electric power in different parts of the river basin. The private benefit-cost criterion becomes irrelevant here. Social benefits have to be measured by the method of alternative costs avoided and social costs have to be measured by the method of benefits forgone. We may however venture to say that there are alternative sources of electric power like coal, oil or atomic energy, which may be imported into a region if not locally available. This is not usually the case in respect of irrigation waters to be supplied from a river in a specific region, the only alternative to supply of river waters being the tapping of sub-soil waters in the region. The latter again depends on natural factors and in fact, canal irrigation in a region usually improves the supply of sub-soil waters. It is therefore essential to recognise that irrigation has to be given highest possible priority in river waters utilisation. Power may be produced by a suitable selection of location and height of a dam but with least possible sacrifice of irrigation.

There is also another point to be borne in mind regarding the supply of irrigation waters to the different

parts of the river basin. Topographical, soil, climatic and other factors influencing agricultural production are usually distributed unevenly over the different parts of the river basin. These factors are generally found to be more favourable in the lower reaches of a river basin as in the case of the rivers Krishna and Godavari. The supply

of irrigation waters and determination of cropping systems best suited for the different parts of a river basin (i.e. wet or dry irrigated or wet-cum-dry irrigated patterns of cropping) has to be therefore based on the principle of comparative cost advantage which is however not easy to determine precisely.

The above considerations suggest that the ideal policy regarding the utilisation of river waters is to take the entire river basin as a unit for planning, to have a multi-purpose plan for the maximum possible production of irrigation waters, power etc., and to make them available to the different parts of the region in such a manner as to maximise net social benefit by way of increased agricultural and industrial production.

We may now proceed to explain the nature of the benefits expected to be received from this project and the nature of costs involved and calculate the traditional benefit-cost ratio with particular reference to primary and direct benefits.

8.3 Nature of benefits and costs.

Generally, the benefits and costs of an irrigation project (or any similar project) can be divided into those which are tangible and those which are intangible. Intangible benefits and costs are those to which by their very nature money value cannot be assigned. A number of economic, social and cultural changes are likely to occur in a region in the wake of a ^{major} irrigation

project which cannot all be evaluated in monetary terms; for instance the benefit of flood control and irrigation which prevent loss of life, damage to property, high incidence of sickness, and which contribute to better opportunities of employment, greater stability and welfare of the community, increased levels of economic and social activities, improvement of conditions of living, improved sources of recreation, etc., are benefits which cannot be measured. On the other hand, there are intangible costs of a project such as those connected with the defacement of a beautiful scenery, submersion of places of historical interest, transfer of population from submerged villages, increased incidence of malaria, etc., and certain types of undesirable social changes accompanying the development of a region. Although these intangible benefits and costs cannot be measured in monetary terms, they should be properly recognised and steps should be taken to *minimise* intangible costs and maximise intangible benefits.

Tangible benefits and costs are those which may be expressed in monetary terms. Tangible benefits refer to increase in production of goods and services emanating from a project directly or indirectly, and tangible costs mean consumption of goods and services required for the construction, maintenance and operation of the project. Increase in production of crops or other primary produce, increased secondary production, increased transport facilities, etc., have all to be reckoned as the tangible benefits ^{of a Project. While such tangible benefits} are capable of measurement in principle, we have to take into account that in several cases, necessary statistical data may not be available, and the known techniques may not be adequate, especially for the measurement of dynamic effects, and of social benefits and costs as distinguished from private benefits and costs.

Tangible benefits and costs of a project are usually classified into primary or direct benefits and costs, and secondary or indirect benefits and costs. Primary benefits represent the value of immediate goods and services resulting from a project and secondary benefits represent the value of goods and services which are produced in activities connected with processing of the immediate goods emanating from the project or increased activities induced by the generation of incomes during project construction. For instance, in the case of an irrigation project, the primary or direct benefit consists of increase in crop production, while the secondary or indirect benefit consists of increased activities of processing, manufacturing, and trade in the irrigated area, brought about by increased crop production; and also increased economic activity either within the project area or outside, induced by the project construction. The latter is necessarily in the nature of a short term benefit. Primary or direct costs are the value of materials and services used for the construction of the project and for securing primary benefit i.e., increased crop production. Secondary or indirect costs are those incurred in securing secondary benefits i.e. costs which are incurred in the processing, manufacturing, transport, and marketing of increased agricultural produce due to the project. In making a benefit-cost appraisal of an irrigation project both primary and secondary benefits and costs should be carefully identified and evaluated to the extent that it can be done with reasonable degree of accuracy.

8.4 Appraisal of direct benefits and costs of the Nagarjunasagar Project

The problems involved in the measurement of

benefits and costs are (1) identification and measurement of benefits, (2) identification and measurement of costs, (3) translation of benefits and costs to a common time basis, and (4) computation of the benefit-cost ratio or comparison of total benefits and total costs. In tackling these problems connected with the first phase of Nagarjunsagar irrigation project, we have proceeded as follows:-

- (1) All costs and benefits are measured at 1959-60 prices. It implies that the relative prices of inputs and outputs may remain more or less constant over the life time of the project. This may not be a tenable assumption, but we have made this assumption for convenience and for ensuring comparability of the economic conditions of the region before and after irrigation.
- (2) In order to reduce costs and benefits to an annual basis, we have assumed a uniform rate of interest of 4% per annum (the project authorities have used 3.75% rate of interest per annum).
- (3) With regard to the annual rate of depreciation to be allowed for certain items of physical capital, we have assumed (a) 75 years as the useful period of life for the project which includes the dam and the canals system (b) also 75 years as the useful life for other types of capital investment (for investment in conversion of dry lands for irrigation purposes) and (c) 25 years period of useful life for capital investment in farm buildings.

- (4) The annual cost of operation and maintenance of the project is taken as Rs.2/- per acre of net irrigated area.

The benefit-cost ratio computed on the basis of the above assumptions and taking into account the irrigation aspect of the 1st phase of the Nagarjuna-sagar Project only, is given in the following table No.8.1

Table 8.1
Benefit-cost ratio

<u>Costs</u>	
* Annual equivalent of capital cost (Rs.139 crores x 0.04248)	= Rs 5.89 crores.
Operation and maintenance costs:	= Rs 0.39 "
Total cost:	<u>Rs 6.28</u> "
<u>Benefits:</u>	
Increase in value added	= Rs. 54.21 Crores
Less increase in cost of hired human labour:	= Rs. 7.09 "
Less interest and depreciation for cost of conversion (Rs.38.48 crores x 0.04248)	= Rs. 1.63 "
Less interest and depreciation on new investment in farm buildings (Rs.9.75 crores x 0.06488)	= Rs. 0.62 "
Net increase in annual production	= Rs. 44.89 "
Present worth at the beginning of 11th year (Rs.44.89 crores x 23.0377)	= Rs.1033.70 "
Present worth of net benefits at the end of construction (Rs.1033.70 crores x 0.6761)	= Rs. 698.88 "
Annual equivalent net benefit over 75 years (Rs.698.88 crores x 0.04248)	= Rs. 29.52 "
Benefit-cost ratio	= Rs. 29.52 "
	<u>Rs. 6.28</u> crores
	= 4.72

(See P.41 " Multi-purpose River Basin Development"
Part 1, published by ECAFE, 1955, for the
formula used in computing annual equivalent costs and benefits).

It may be seen from this table that the annual cost of the total investment of Rs.139 crores in the project is estimated at Rs. 5.89 crores (interest

and depreciation)¹ _____

_____ The annual cost of operation and maintenance is estimated at Rs.0.39 crores. The total annual cost of investment in the project thus comes to Rs.6.~~29~~¹⁷ crores. The annual equivalent net benefit in the form of increased crop production, allowing for deductions on account of increased costs of cultivation, and interest and depreciation on capital investment for conversion of dry lands for irrigation and farm buildings, is estimated at Rs.29.~~69~~⁵² crores. The benefit-cost ratio thus arrived at is found to be 4.74. The economic justification of the project is therefore beyond question, even if we make ^{an} allowance of 10 to 20% (correction factor) because future benefits and costs can never be estimated precisely involving no uncertainty at all.

8.5 Indirect benefits of the Project.

As regards the secondary benefits of the irrigation project we have not found it possible to make an estimate for lack of sufficient data. However, the secondary benefits are likely to be substantial and significant because the main agricultural products of the region, paddy and oil seeds, are processed before marketing and these are also surplus agricultural products

1: The cost of the project (1st phase) was ^{originally} estimated at Rs. 91.12 crores. This was revised in 1961-62 and raised to Rs.139.53 crores. The following are the main grounds on which the original project estimates are revised (i) Increase in cost due to rise in wages, cost of materials particularly cement, and in the rates of works (ii) Increase in quantities of masonry for dam and additional masonry works ^{found} necessary as a result of detailed investigation. The revised estimate of Rs.139 crores is accepted by us for purposes of calculating the benefit-cost ratio as the year of survey is close to the year of revision.

of Andhra Pradesh. About 5% of the value of agricultural output purchased by the processing industries and farm inputs purchased from outside the agricultural sector~~X~~ (e.g., chemical fertilizers, ~~X~~ pesticides, etc.,) may be taken as a reasonable estimate of the net indirect benefit of irrigation.² .

8.6 Effect of size and multi-purpose character of the Project on benefit-cost ratio.

It may be noted that our estimate of the direct or primary benefits and costs of the Nagarjunasagar Project is relevant only to the size of the project restricted to its 1st phase and the irrigation aspect. The benefit-cost ratio is certain to be still higher if (a) a part of the total investment in the dam is allocated for supply of power from the project, and (b) if the size of the project (height of the dam and storage capacity) is increased, as this will bring about considerable economies of scale or reduction in marginal costs.

8.7 Limitations of the benefit-cost ratio:

The benefit-cost ratio calculation is traditionally used in the U.S.A. to find out whether a project is justified or not from the economic stand-point. The underlying principle is that a project is not economically justified unless the benefit-cost ratio is greater than one or at least unity. The concept, however, is subject to certain limitations. Firstly, as already pointed out,

2: This is the method used by the Bureau of Reclamation of U.S.A. The indirect benefits of irrigation can also be computed by assuming that for a given rise in the output in agricultural sector, the output in the secondary and tertiary sectors will rise by a certain proportion.

the ~~xx~~ intangible benefits and costs cannot be calculated, and in developing countries the intangible benefits of irrigation projects are likely to be substantial and significant. Secondly, it is extremely difficult to take into account various dynamic and long-term and economic effects of irrigation within the project area and outside the project area. Thirdly, estimation of future benefits and costs, especially when the future is spread over a long period of 50 to 100 years, involves assumptions about the prices of inputs and outputs, wage rates, rates of interest, etc., which may not be tenable. Fourthly, the use of prevailing or expected market prices of inputs, outputs, wage rates etc., implies use of measures of private benefit and private cost, where as measures of ~~s~~ social benefit and social cost are to be adopted for the purpose of estimating the net benefit of the project from the point of view of the community. In measuring benefits from the point of view of the community for instance, the market prices of crops or agricultural output may have to be suitably modified to take into account cost of alternative methods by which the products can be made available. For example, if the import price of an agricultural commodity produced in a project region is higher than the domestic cost or price of the commodity and if domestic production replaces imports, the commodity has to be evaluated at the import price in order to measure the ^{time} or intrinsic benefit, (this is known as the method of alternative cost avoided)³.

³: "Suppose that the crop raised in rice and that home production is insufficient so that rice is also imported. If the world price should be higher than home price (imports being subsidized), then clearly the social benefit obtained per unit of additional output is equal to the cost of importing the product, equal, that is to the home price plus the subsidy" (P.41) "Multipurpose River Basin Development" Part I United Nations.

measurement of costs, money costs do not always reflect opportunity costs (or benefits forgone), particularly in developing countries where divergence between private and social costs may be significant.⁴ For example, the use of unemployed or unproductively employed labour in the construction and maintenance of an irrigation, ^{Project} involves little cost to the community, and its evaluation at market ^{Wage} rates would imply an over-statement of the true cost of labour. On the other hand, in order to arrive at the true social cost of capital invested in the project, the market rate of interest may have to be considerably increased.⁵ Similarly evaluation at the prevailing exchange rate of imports of capital goods or other materials for the construction of the project, or imports of agricultural commodities the domestic production of which will increase in the project area after irrigation, will mean considerable understatement of the true or intrinsic value of the imported goods.⁶

4: "Moreover, the scheme may use up substantial goods and services which have a price less than opportunity costs (benefits foregone). The most important of these items frequently is foreign exchange (command over imports) If foreign exchange is scarce, the price at which the project authorities obtain currency for the purchase of foreign equipment and materials may be too low to be taken as a measure of the social cost of imports". "Multi-purpose River Basin development" Ibid. Part 1. Manual of River Basin Planning, United Nations, pp.43-44).

5: and 6: Refer 'Design for Development' By Tinbergen, p.39

8.8 Net benefit to farmers:

The previous discussion of benefit-cost ratio for the first phase of Nagarjunasagar irrigation Project has shown beyond doubt that it is economically justified both from the narrow stand-point of net direct primary benefit and from the point of net social benefit. This benefit however does not accrue exclusively to farmers alone. It is shared by all classes in the community within and outside the Project area. The net direct monetary benefit is however shared by all the factors of production employed in agriculture and to some extent by the state. It is our object in this section to make a specific reference to the net benefits received by the farmers in return to their own land and capital and the labour of their family members utilised for cultivation.⁷ This benefit is best measured by the concept of farm business income. In the following section, the share of the net primary benefit and other benefits that accrue to the state will be referred to.

According to our estimates of farm business income before and after irrigation in the Project area, the increase in farm business income on the Right Bank Canal side has amounted to a total of Rs.20.03 crores, and Rs.8.23 crores on the Left Bank Canal side, making, ~~total~~ Rs.28.26 crores for the whole project area. Before irrigation, i.e. in 1959-60, the total amount of farm business income amounted to Rs.8.35 crores

7. Farmers will also receive considerable amounts of secondary benefits to the extent that they also undertake processing and manufacturing^{and} also various kinds of intangible benefits.

~~cess~~ only. The significance of this increase in farm business income may be better appreciated by considering estimates of farm business income per acre, which is found to increase from Rs.46.63 per acre in 1959-60 to Rs.191.31 per acre after irrigation. It may be mentioned here that in computing the farm business income per acre after irrigation we have taken the average rent paid per acre in the Paddy zone as obtained in Farm Management Studies in the West Godavari District. Similarly, we have taken the average amount of land revenue and cesses as obtained in Farm Management Studies (Rs.13.04 per acre) for estimating land revenue and cesses on wet land and $2/3$ of it for dry irrigated land. The rate of depreciation on machinery and farm buildings used is the same as obtained ⁱⁿ the Paddy zone of the West Godavari district. The relevant details of gross value of output, cost of cultivation and farm business income pertaining, to both Right and Left Canal areas of the Project are given in the following table No.8.2.

Table No. 8.2

Farm business income before and after irrigation

	Right Canal		Left Canal		Project Area	
	Per Acre	Total	Per Acre	Total	Per acre	Total
1. Farm business Income before irrigation (in 1959-60)	Rs. 55.89	Rs 6.77 Crores	Rs 28.63	Rs 1.78 crores	Rs 46.63	Rs 8.55 crores
<u>Farm Business Income after irrigation:</u>						
Gross value of output:	Rs. 439.24	Rs 49.37 "	Rs 336.75	Rs. 26.94 "		
Less cost of material inputs:	Rs. 82.47	Rs 9.27 "	Rs 76.75	Rs. 6.14 "		
Less cost of hired human labour	Rs 51.51	Rs 5.79 "	Rs 66.75	Rs 5.34 "		
Less rent paid	Rs. 38.70	Rs 4.35 "	Rs 38.70	Rs 3.10 "		
Less land Revenue & Cesses:	Rs 10.92	Rs 1.23 "	Rs 12.23	Rs 0.98 "		
Less depreciation:	Rs 5.17	Rs 0.58 "	Rs 5.17	Rs 0.41 "		
Less interest on cost of conversion	Rs 12.00	Rs 1.35 "	Rs 12.00	Rs 0.96 "		
F.B.I. after irrigation	Rs 238.43	Rs 26.80 "	Rs 125.13	Rs 10.01 "	Rs 191.31	Rs 36.81 Crores
Increase in F.B.I. after irrigation	Rs 182.54	Rs 20.03 "	Rs. 96.50	Rs 8.23 "	Rs 144.68	Rs 28.76 "

8.9 Problem of financial returns on investment in the Project:

When public funds are invested so as to benefit primarily a particular section of society as it is in the case of ^{an} irrigation Project, it would appear natural and just to take from those directly benefited by the Project a total or partial payment of the monies invested. This raises several questions such as identifying sections of society which benefit from the Project, their present economic condition and its improvement on account of the Project, the extent to which reimbursement of funds invested in the Project should be limited and the methods of reimbursement, such as taxes, fees and special assessments. However, care should be taken to see that the policy of recovering monies invested in the Project partially or totally does not adversely affect the ~~incentives~~ ^{initiative} of farmers and ~~does not~~ inhibit the rapid and successful development of the Project area. In fact the State may have to play a more positive role under certain circumstances by further investing monies on social overheads, like roads and railways, training schools and institutes, research, etc., and secondary investments relating to supply of fertilisers, processing of agricultural produce, warehouses, mechanized equipment for land reclamation, etc.,

The principles which should generally govern the determination of betterment levies and water rates may be briefly referred to. Firstly, while a betterment levy is proper and just when a particular business or property secures an identifiable benefit out of the Project, this should however have some relation to the amount of net benefit per acre as well as the size of

the cultivators' holding. It is but just that small holdings are not unduly burdened with benefit levy, especially because they have to borrow considerable amounts of long-term capital for land reclamation, purchase of bullocks and implements etc. In the case of water rates or Government charges of irrigation, there are practical difficulties in making charges proportional to the quantity of water supplied to individual cultivators. The charges have to be therefore related to the net return from cultivation, the charges being higher in the case of some commercial crops which usually yield high net returns. In any case, irrigation charges cannot be very different from the rates prevailing in the neighbouring delta areas.

In the previous sections dealing with net benefit to farmers, we have seen that the amount of land revenue and cesses, calculated at the overall average rates obtaining in the Paddy Zone of the West Godavari District (2/3 of the Wet rate being applied to the dry irrigated land) yields a total revenue of Rs.2.21 crores. In the Joint Report on the Nandikonda Project (1954), a rate of Rs.15 per acre of wet crops and Rs.10 per acre of dry irrigated crops are assumed for calculating the direct financial returns to the State. At these rates, the revenue from the first phase of the Nagarjuna Sagar Project, will be Rs.2.⁷⁷ crores. In the same report, betterment levy on land is suggested at Rs.200 ~~xxxxxx~~ per acre of wet land and Rs.100 per acre of dry irrigated land. At these rates, the total amount of betterment levy will be Rs.30.49 crores for the first phase.

It appears to us that the rates of betterment levy suggested are rather on the low ~~side~~ side and the disparity between rates suggested for wet and dry irrigated lands is not fully warranted. According to our study of the primary benefits of irrigation in the project area accruing to farmers, the rate of betterment levy suggested is less than ~~the~~ one year's value of gross output or even net output in the case of irrigated paddy, and much less in the case of commercial crops like chillies, country tobacco and groundnut. The rate of betterment levy on wet land may be raised at least to Rs.250/- per acre and the rate on dry irrigated land to at least Rs.200/- per acre. The total yield of ~~benefit~~ ^{betterment} levy at these rates will be Rs.43.6 crores. Thus if betterment levies and water rates are collected at these rates, the direct financial return on the investment in the project will exceed 3 per cent ~~return~~ per annum. If we make allowance for additional revenue that may accrue from sale of hydro-electric power, the financial return on investment will further increase. Further, apart from the question of net social benefit arising to the community out of the project, Government revenues will increase not only from land revenue and cesses but also from all other taxes levied by the State and Central Governments, as agriculture, industry and trade expand in the area. Thus if due allowance is made for all these factors, the project will have to be considered a productive one even from the narrow standpoint of financial productivity. If the second phase of the Nagarjuna Sagar irrigation Project is also taken up as envisaged originally, the project is likely to yield considerable surplus revenue to the State. It is however well known that the principle of

financial productivity is ^a crude ^d and unscientific measure of the productivity of an irrigation project nor there is any sanctity attached to the policy of recovering full cost of the project from its direct beneficiaries. If there is inadequacy of financial return estimated at existing levels of taxation, and if increase in tax rates is not considered feasible or even desirable, the problem has to be tackled through appropriate offsetting taxes in other parts of the economic system as a matter of deliberate policy. This is a matter of great importance because irrigation projects (and multi-purpose river projects) constitute significant long-term programmes for economic and social development and yield substantial social benefits, ^{hence} and a part of the direct monetary cost may as well be defrayed, if necessary, from public funds.

....

SUMMARY AND RECOMMENDATIONS

The Nagarjunasagar Project is intended to provide *in its phase* irrigation facilities to 11.24 lakhs of acres on the Right Bank Canal side and 8.0 lakhs ^{or} acres on the Left Bank Canal side. The general backwardness of the rural economy of the Project area and the nature of meagre resources at the command of the farmers is brought out clearly by the survey. In this connection the following figures portray vividly the existing position.

Indicator	Right Bank Canal side		Left Bank Canal side
	Stratum 1	Stratum 2	Stratum 3
1. Annual rate of population growth (%)	1.20	0.69	0.51
2. Population per square mile	418	301	248
3. Value of land per acre Rs.	1240	638	558
4. Percentage of leased in land	14.1	8.5	7.5
5. Income of agricultural households from land:			
i) Per operational holding (Rs.)	59.75	43.05	32.32
ii) per households (Rs.)	405.73	373.37	317.49

Though the farmers are generally poor and traditional in their outlook they are quite familiar with the agricultural practices of growing irrigated paddy and other important food and commercial crops. They are fully aware of the potential benefits of the Project and are eagerly awaiting the waters from the Project for irrigation. If fertilisers, improved seed and other resources are made available to the farmers in requisite quantities

the region may soon be expected to become the scene of intense agricultural activity accompanied by a ~~rapid~~^{quick} increase in the population density and trade and other economic activities.

At present there are about 10 important trading and industrial centres on the Right Canal side and 4 on the Left Canal side. All of them are ^{not} in the ayacut but those that are outside the ayacut are close to the border of the ayacut. For trade and similar purposes all of them serve the ayacut region. The following ^{are} the list of centres ~~inside or near the border of the Right Canal and the Left Canal areas.~~

<u>Right Canal area</u>	<u>Left Canal area</u>
1. Chilakaluripeta	1. Miriyalaguda
2. Piduguralla	2. Jaggayyapeta
3. Rentachintala	3. Suryapeta
4. Addanki	4. Khammam
5. Sattenapalli	
6. Narsaraopet	
7. Vinukonda	
8. Ongole	
9. Kurichedu	
10. Guntur.	

Except in Guntur there are few rice mills in the Right Canal zone. On the Left Canal side mills which are used for ^{extracting groundnut oil are also used} for processing paddy. These will have to be greatly increased in number when the ayacut is developed. The food+grains including paddy are likely to increase ^{to} 3 or 4 times the present ^{quantum} of production and there is a very great need to establish a large number of processing industries in the ayacut area.

Some other important processing industries are castor oil crushers and cotton ginning mills. The tobacco redrying

factories are concentrated mostly in the areas surrounding Guntur and Chilakaluripet.

On the Right Canal side the fixed capital per trader is about Rs.26,000, and the working capital Rs.61,000 of which Rs.36,000 is provided by himself and Rs.25,000 borrowed from money lenders and banks. On the Left Canal side a trader has, on the average, fixed capital of about Rs.4,000, and working capital of about Rs.40,000 of which nearly a half is provided by himself and the remaining half borrowed from money-lenders and banks.

Coming to the millers, a groundnut oil miller on the Right canal side has a fixed capital Rs.1.11 lakhs, and a working capital of Rs.1.93 lakhs of which Rs.1.17 lakhs is borrowed from money lenders and banks. On the Left Canal side the average fixed capital of a groundnut oil miller is Rs.1.11 lakhs, and a working capital of Rs.2.73 lakhs of which Rs.1.17 lakhs is borrowed from money lenders and banks.

On the Right Canal side the castor oil crushers are mostly situated in the Narasaraopet and Sattenapalle areas. The fixed capital per crusher is about Rs.17,000 and the working capital Rs.22,000. Nearly Rs.15,000 of the working capital is provided by the owner himself. There are only a few stray castor oil crushers on the Left canal side.

Taking an overall view of the existing position of millers in respect of working capital, we find that the banks play a vital role in providing a high percentage of working capital as credit. The following figures indicate the position

	<u>Working Capital</u>		
	<u>Own</u>	<u>Borrowed from</u>	
		Banks	Money lenders
Right Canal side	58.89%	32.48%	8.63%
Left Canal side	39.64%	45.71%	14.65%

After the irrigation facilities are obtained and the agricultural produce increases, the processing industries

must be increased in their numbers, variety, and size. The location of these industries is likely to have some effect on the eventual crop pattern that is going to be raised. A liberal policy in banking combined with a considerable ^{em} extension of the banking system will have to be planned for in advance, and put through speedily.

The existing position in respect of cost per acre in farm business, output per acre in crop production, farm business income per acre, output-input ratios for farm enterprise is as follows

	<u>Right Canal side</u>		<u>Left Canal Side</u>
	<u>Estimated Values</u>		<u>Estimated Values</u>
	S ₁	S ₂	S ₃
1. Cost per acre in farm business (Rs.)	184.52	118.28	125.41
2. Output per acre (Rs.)	192.8	107.6	101.0
3. Farm business income per acre (Rs.)	76.0	40.0	27.5
4. Output-input ratio in crop production	1.04	0.91	0.81

The following are the estimates of total agricultural output, total input, and total Farm Business income in the Project area.

(All figures are in crores of Rupees)

<u>Item</u>	<u>Right Canal area</u>		<u>Left Canal area</u>	<u>Total</u>
	S ₁	S ₂	S ₃	
1. Gross agricultural output	10.88	6.40	6.10	23.38
2. Total Input	10.67	6.89	7.38	24.94
3. Farm business income	4.17	2.59	1.78	8.54

At present important crops grown in the Project region are virginia tobacco, country tobacco, irrigated paddy, chillies, ragi, groundnut, vegetables, jowar mixed with redgram, cotton, pulses and oilseeds. Of these virginia tobacco is grown on the Right Canal side in rich black cotton soils under rainfed conditions where rainfall is not too scanty.

Though this is a very profitable crop the farmers have to put in considerable ^{amount of} capital in the crop production, and also face a number of uncertainties. As this crop fetches foreign exchange, a compact area where this crop is widely grown is excluded from the ayacut. It is natural to expect farmers who have some experience of growing virginia tobacco to continue to grow this crop whenever the soil and the weather conditions are favourable. The growing of this crop by farmers will not enter into the picture when benefits from the project are considered. Irrigated paddy is grown mostly under tanks. It is fairly extensively grown on the Left Canal side, a part of it being cultivated under canals of Palair river. On the Right Canal side too, irrigated paddy is grown but to a lesser extent. Though the yields are high in some places, they are not on the whole high enough, one main likely reason being that the yields under irrigation by river waters are generally better than those under tank and well irrigation.

Country tobacco which is a very important crop at present is likely to retain its position in the new set-up also.

Among other crops, chillies is found to be a profitable crop which has great potentialities of much higher yields under dry irrigation.

On the Left Canal side vegetables are found to be profitable, and as the Project region develops it is perhaps going to be an attractive and profitable crop.

We give below the actual and likely values of output of selected crops before and after irrigation.

<u>Value of output of some selected crops before and after irrigation.</u>				
Crop	<u>Before irrigation</u>		<u>After irrigation</u>	
	Cost of material inputs Rs.	Value of output Rs.	Cost of material input Rs.	Value of output Rs.
1. Irrigated paddy	148.59(S ₁)	303.16(S ₁)	87.04(S ₁ +S ₂)	359.88(S ₁ +S ₂)
	86.17(S ₂)	241.83(S ₂)		
	130.74(S ₃)	352.25(S ₃)	79.28(S ₃)	355.00(S ₃)
2. Jowar	48.88(S ₁)	126.30(S ₁)	62.41(S ₁ +S ₂)	227.06(S ₁ +S ₂)
	38.57(S ₂)	79.87(S ₂)		
	25.47(S ₃)	64.36(S ₃)		
3. Ragi	44.23(S ₁)	115.69(S ₁)	67.78(S ₁ +S ₂)	258.76(S ₁ +S ₂)
	131.37(S ₂)	248.60(S ₂)		
4. Variga	83.06(S ₁)	119.0(S ₁)	82.04(S ₁ +S ₂)	172.24(S ₁ +S ₂)
	63.52(S ₂)	116.81(S ₂)		
	35.89(S ₃)	63.92(S ₃)		
5. Chillies	102.71(S ₁)	293.65(S ₁)	152.41(S ₁ +S ₂)	1448.72(S ₁ +S ₂)
	210.11(S ₂)	496.98(S ₂)		
	65.65(S ₃)	110.22(S ₃)	145.62(S ₃)	1353.89(S ₃)
6. Groundnut	47.11(S ₁)	119.63(S ₁)	68.52(S ₁ +S ₂)	
	56.59(S ₂)	110.90(S ₂)		
	65.64(S ₃)	81.26(S ₃)	64.64(S ₃)	199.35(S ₃)
7. Cotton	22.60(S ₁)	48.62(S ₁)	45.78(S ₁ +S ₂)	134.67(S ₁ +S ₂)
	15.02(S ₂)	56.96(S ₂)		
	19.32(S ₃)	40.18(S ₃)	39.26(S ₃)	117.07(S ₃)

Though cotton, variga, jowar, korra, castor etc. and mixed crops are now grown on vast extents for want of better alternatives, they may be grown only on very limited extents of land when the Project waters enable the farmers to grow superior crops. The existing input-output structure estimated from our Farm Surveys and the likely input-output structure after irrigation arrived at on the basis of Farm Management studies and other Reports are given below for selected crops.

EXISTING INPUT-OUTPUT STRUCTURE AND THE LIKELY INPUT-OUTPUT STRUCTURE AFTER IRRIGATION

At present				After irrigation		
Region and the name of crop	Human labour (8-hr Man-days)	Bullock labour (8-hr pair-days)	Yield (in lbs)	Human labour (8-hr man-days)	Bullock labour (8 hr. pair-days)	Yield in St. maunds
<u>Right canal area</u>						
Paddy	67.59 (S ₂)	7.08 (S ₂)	1124 (S ₂)	50	8	24.00
Chillies	38.59 (S ₁)	5.07 (S ₁)	314 (S ₁)	60	7	1600 lbs
Country tobacco	38.42 (S ₁)	7.02 (S ₁)	415 (S ₁)	30	8	6.00
Ragi	85.66 (S ₂)	26.86 (S ₂)	1274 (S ₂)	50	6	16.00
<u>Left Canal Area</u>						
Paddy	72.98	21.51	1857	50	8	24.00
Chillies	28.53	6.92	128	60	7	1600 lbs
Groundnut	21.29	5.65	365	50	4	11.00

We have found that about 12 non-farm activities are of any importance in the Project region. Listed in order of profitability¹, they are as follows:

<u>Activity or enterprise</u>	<u>Net income per household</u> Rs.
1. Carpentry	425.27
2. Transport	403.94
3. Blacksmithy	379.12
4. Laundry	248.75
5. Tailoring	222.17
6. Goldsmithy	214.67
7. Weaving	172.45
8. Basket making	119.01
9. Mills	112.05
10. Pottery	104.63
11. Cobblery	22.80
12. Ambercharkha	-0.85

1. Profitability stands for income over and above wages and returns to investment.

For making projections for future we have made use of the likely input-output structure of crops after irrigation as the basis for working out the value added ⁱⁿ ~~by~~ crop production (which is the benefit received by the community) ~~for arriving at the optimal crop pattern and~~ the maximisation of which is adopted as the criterion ^{for arriving at the optimal crop pattern} ~~Here again~~ we have employed the method of linear programming to arrive at the most profitable combination of crops.

After setting apart extents for country tobacco and chillies, and also for vegetables on the Left Canal side, on an ad hoc basis which we have felt reasonable, and after setting apart 80% of the land on the Left Canal side and 33.33% on the Right Canal side for paddy as per the localisation policy of the Project Authorities we have tried out crop programmes for the balance of the land, assuming different levels of resources to know roughly the resource requirements to leave no part of the land unutilised. After this, we have assumed increased resource availability at suitable levels, and carried out linear programming allowing the crops to compete on the basis of their would be input-output relationships. This work was not carried out for the entire Project region as one aggregated extent of land for the Right and Left canal areas. The land on each of the Right and Left Canal sides is first allocated to four different size-groups which represent the position in a sufficiently realistic way, since these sizes can be taken to represent the small, the medium, the big, and the very big holdings. The used up levels of resources for the crop pattern finally emerging out of the linear programming give the requirements for adoption of the optimal crop pattern. The existing resources are estimated from our sample surveys. Using these two, we worked out the shortages in resources. We now give the optimal crop patterns worked out for the four typical-size farms on the Right and Left Canals sides.

Right Canal area

(a) Optimal crop-pattern for the four typical-size (All figures are in ^{acres})

Size-group (in acres)	Average size	Chillies	Country tobacco	paddy	Ragi (Second crop)	Jowar + redgram	Groundnut
0.01 - 2.50	1.26	0.17	0.11	0.42	0.36	0.20	
2.51 - 7.50	4.83	0.64	0.43	1.62	1.29	0.86	
7.51 - 15.00	10.65	1.42	0.95	3.55	1.41	3.32	
Above 15.00	24.81	3.31	2.21	3.27	10.69	0.33	

(b) Near Optimal crop-pattern with groundnut on half the extent under the crop
(Jowar + redgram) in the Optimal Crop pattern of the Right Canal area.

0.01 - 2.50	1.26	0.17	0.11	0.42	0.36	0.10	0.10
2.51 - 7.50	4.83	0.64	0.43	1.61	1.29	0.43	0.43
7.51 - 15.00	10.65	1.42	0.95	3.55	1.41	1.66	1.66
Above 15.00	24.81	3.31	2.21	3.27	10.69	0.17	0.16

Left Canal area

Optimal crop-pattern for the four typical-size groups of farms

Size group (in acres)	Average size	Chillies	Country tobacco	paddy	Vegetables	Jour + cucumber	Groundnut + Redgram	Other mixtures.
0.01 - 2.50	1.47	0.02	0.01	1.19	0.02	-	0.23	-
2.51 - 7.50	5.00	0.06	0.03	4.06	0.06	-	0.35	0.44
7.51 - 15.00	10.69	0.13	0.07	8.69	0.13	1.08	0.59	-
Above 15.00	27.62	0.35	0.17	22.44	0.35	2.79	1.52	-

We next give below a comparative statement of the total value added by crop production in the Project region now and by the adoption of optimal crop-pattern after irrigation.

	Value ^{added} in crop production at present Rs.	Value added after irrigation Rs.
1. Right Canal area	10,12,73,540.28	42,78,97,746.54
2. Left Canal area	3,38,67,232.92	20,79,50,750.22

The optimal crop pattern relates only to growing of a single crop on land in the year. It seems very reasonable to assume a cropping intensity of nearly 1.3. This means that pulses and oil seeds, fodders, etc., can be grown in the paddy fallows and as second season crops in the year. Since groundnut is near substitute for some crops occurring in the optimal crop pattern as per the criterion of value added, some farmers are likely to grow this crop for reasons of diversity of cropping, ready marketability of crop and their own ³part tradition. Thus in the final picture the Project area is likely to have a well diversified crop pattern without having to deviate essentially from the optimal crop pattern. The benefits worked out in the linear programming are based only on assumptions of increased resources becoming available without involving any spectacular changes in agricultural practices. Thus optimal crop pattern can be adopted straight-away in the short run period by only planning for providing the requisite resource facilities to the farmers of the Project area.

For the optimal crop pattern the resource requirements, availability of the resources at present and the gaps between them are as follows.

Resource availability and additional requirement for the optimal crop pattern

<u>Name of Resource.</u>	<u>Resource availability</u>	<u>Resource required</u>	<u>Gap</u>	
			<u>Physical</u>	<u>Value (Rs.)</u>
<u>Right Canal area</u>				
1. Bullock labour (pair days)	20,66,980.46	23,62,980.73	—	—
2. Other variable inputs (in Rs.)	3,55,62,625.95	6,98,74,309.73 6,98,74,309.73	—	3,43,11,683.38
<u>Left Canal area</u>				
1. Human labour (8 hr. mandays)	36,89,662.00	88,83,285.00	1,73,121 workers	—
2. Bullock labour (pair days)	14,31,107.00	27,29,280.00	43,272 pairs of bullocks	2,63,00,000.00
3. Other variable inputs (in Rs.)	1,30,16,330.78	3,93,23,166.00	—	2,63,06,835.22

As per the revised estimates, the outlay on the first phase of the Project is ^{of the order of} Rs. 139 crores, we have examined the question whether for this outlay the project is a paying one by working out the benefit-cost ratio. Taking the benefit to be received by the Community as the criterion which, in fact, should be ^{the} main consideration in analysing the benefits in a big national project like the present one, the benefit-cost ratio has worked out to 4.74 even without including indirect benefits. If the question of benefit-cost ratio is considered for the two phases of the Project taken together, the position will be much more satisfactory, because considerable extension of irrigation facilities can be achieved with marginal expenditures for increasing the height of the dam and the lengths of the canals. The benefit due to spread-effect will also be more pronounced. Even judged by consideration of the financial returns on Government's investment, the Project is paying, especially when the augmentation of Government revenues from sale of hydro-power and ^{electric} further yields of taxes levied by the Central and State Governments, as trade and industry expand in the area, is taken into account.

As the agricultural produce is going to increase several fold after irrigation, it is essential that the amenities of transport, marketing and credit of the corresponding magnitude should be created forth-with in the Project area if the investment in the Project is to bear fruit in an adequate measure at an early date. To this end the steps indicated below are to be immediately taken as a minimum programme.

i) The farmers on the Right and Left Canal areas, as estimated by us, will be in need of Rs. 5.79 crores and Rs. 5.34 crores for paying wages for hired human labour for agricultural operations. The requirement ^{for payments to} of hired bullock labour works out to Rs. 0.70 crore for the Right Canal area and Rs. 0.44 crore for the Left Canal area.

The rest of the variable inputs required for the Right Canal area is estimated to be Rs.2.4 crores and for the Left Canal area Rs. 2.75 crores.

The wages to be paid for hiring human labour and bullocks and for the value of other variable inputs work out to a total of Rs.8.89 crores for the Right Canal area and Rs.8.53 crores for the Left Canal area. Thus the total requirement comes to Rs.17.42 crores annually. Here we have adopted the uniform principle that the farmers on the Right Canal side will provide for themselves 50% of their financial requirements, and the farmers on the Left Canal side will provide for themselves 25% of their requirements. The rest of the above short-term requirement of Rs.10.84 crores has to be provided in the form of credit to the farmers by the Government through cooperative credit societies and other suitable agencies.

Coming ^{to} the physical aspect of the short-term requirements of the farmers for agricultural operations, seed of the value Rs.3.1 crores and chemical fertilisers of the value of about Rs.1 crore will have to be made available for the Project region for adopting the optimal crop pattern.

ii) For purchase of cattle, machinery and implements and for construction of farm buildings long-term finance of the order of Rs.15 crores will be needed by the ~~farm~~^{farmers} in the Project area. Out of the approximate requirement of Rs.8 crores on the Right Canal side, about Rs.4.0 crores can will be needed by the farmers of the Right Canal side. The long term financial requirement for the Left Canal side is over Rs.7.0 crores so that after deducting 25% of it as self finance the long-term credit requirement for this area comes to about Rs.5.5 crores.

→ be expected to be forthcoming in the form of self-finance. Then a long-term credit facility of about Rs.4 Crores

iii) Long-term credit is also required for effecting improvement on land. Most of such improvement will now consist of conver^ting lands from dry cultivation to wet cultivation. Adopting an average rate of Rs.200 per acre for conversion of lands to suit wet cultivation and for other improvements, about Rs.22.5 crores will be required as finance on the Right Canal side, and Rs.16.0 crores as finance on the left canal side. When the 50% of the former amount and 25% of the latter amounts are deducted ~~for~~^{as} self finance, it will become the responsibility of the Government to provide directly or through cooperative societies a long-term credit of about Rs.11 crores to the farmers of the Right Canal area and 12 crores for the farmers on the Left Canal area.

Coming to the consideration of resource requirements in physical terms, the shortage of bullock pairs on the Right Canal side is estimated to be 10,000 and on the left Canal side 44,000. Steps should be taken to help the farmers to secure bullocks of good breed on a very big scale. To meet the difficulty in importing the requisite number of bullocks from outside the region, use of small tractors may be encouraged. In such a case the farmers must be helped either to purchase the tractors or hire them.

iv) On the Right Canal side the present seasonal migration of agricultural labourers to neighbouring delta areas may more or less come to a stop. In peak-seasons of agricultural operations, there may not be any significant shortage of human labour in the Project region, if all the work-force with agriculture as the main or a subsidiary employment is available for agricultural work.

But when we come to consider the situation on the Left Canal side, the position is extremely unsatisfactory. The actual requirements of human labour during

the peak month of June/July after irrigation facilities from the Project are obtained, is estimated to be 88.8 lakhs of mandays, out of which 81.2 lakhs are required exclusively for growing irrigated paddy on the 6.5 lakhs of acres localised for it. A serious shortage of supply of human labour is thus certain to arise on the Left Canal side. Even after 10 ^{years}, the natural increase in work-force will be only about 1/8 of the additional requirement. Hence steps must be taken immediately for planned immigration of population into the Left Canal area on a large scale. How far mechanization will help the situation may also have to be thoroughly examined.

For a developing region to sustain its development it must be opened up by rail and road routes adequately. A great deal depends on how different parts of the region are linked with one another and how it is connected with the rest of the country.

Road transport.

The existing mileage of roads has not only to be improved but also has to be nearly doubled over a period of 10 to 15 years. It will be necessary to give high priority to construction of village roads connecting them to market centres and railway stations. A well developed system of district and village roads and State and National Highways is also essential for facilitating the use of motor vehicles for both freight and passenger traffic.

Rail transport.

As mentioned in ^a ~~the~~ previous chapter, a considerable extent of the ayacut area lying to the ~~west and~~ ^{- west} south of ~~the~~ Guntur is very inadequately served by ~~the~~ Railways. It is of utmost importance that a new railway line is constructed, connecting the Nagarjunasagar dam side with the Ongole railway station as recommended ⁱⁿ ~~by~~ the Techno-economic Survey of Andhra Pradesh. This line will help avoid the transport of the produce to south through the circuitous and already over congested route via, Vijayawada.

It is also of utmost importance to convert the present Guntur-Macherla meter-gauge line into Broad gauge line so as to facilitate not only efficient transport of produce of the ayacut area but also to accelerate the pace of industrialization of the area between Guntur and Macherla. In this connection, the existing siding of the railway line, Macherla to the Dam site, should be taken over by the Railway Authorities and converted into a broad gauge line and retained as a permanent rail link between Macherla and the Dam site.

On the Left Canal side, there is no railway line running at present through the Project area, the Vijayawada-Kazipet line being away from the boundary of the ayacut fixed for the first phase. With the policy of localisation of nearly 80% wet on the Left Canal side, the area is likely to become densely populated and the trade and commerce increasing several-fold. ^{Also} The Nalgonda district is said to be rich in mineral resources.

A railway line from the Dam site to Hyderabad via Miriyalaguda is a special need of the region for a rapid agricultural and industrial development of the area.

By far the most important requirement of the region is that of its being opened up by a railway line from the Dam site to Khammam. This line will ^{almost} run entirely through the project area and will serve as an artery for the flow of traffic between ^{the} Dam site and the Vijayawada-Kazipet railway line.

Inland Navigation.

In order to facilitate traffic within the Project area, major canals in the Project area have to be developed suitably for navigation. Inland waterways transport can become a most valuable facility supplementing road and railway transport. It will also help the development of industries connected with canal traffic such as the manufacture of country craft.

The transport facilities have to be developed at least simultaneously with the completion of the Project, if not in advance so that the resources required for crop production, equipment needed for processing industries, etc., can be transported to various places into the Project area, and the surplus produce moved out of it without leading to serious bottlenecks which will otherwise make a good part of the outlay on the Project infructuous.

V) Before concluding the chapter we ^{may} briefly touch ^C upon the aspect of betterment levy. In the determination of betterment levies and water rates, it is to be noted that the charges have to be related to the net income from ^{Cultivation}, the charges being higher in the case of some commercial crops which usually yield high returns. In the Joint Report on the Nandikonda Project, betterment levy on land is suggested at Rs.200 per acre of wet land, and Rs.100 per acre of dry irrigated land. At these rates the total amount of betterment levy will be Rs.30.49 crores. It appears to us that the rates of betterment levy suggested are rather on the low side and the disparity between rates suggested for wet and dry irrigated lands is not fully warranted. The rate of betterment levy suggested is less than one year's value of gross output or even net output in the case of irrigated paddy, and much less in the case of commercial crops like chillies, country tobacco and groundnut. The rate of betterment levy on wet land may be raised ~~at least~~ to Rs.250/- per acre and the rate on dry irrigated land to ~~at least~~ Rs.200/- per acre. The total yield of betterment levy at these rates will be Rs.43.6 crores.